Reliability of Visual Inspection for Highway Bridges, Volume II: Appendices

FHWA-RD-01-021

JUNE 2001

U.S. Department of Transportation
Federal Highway Administration

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, VA 22101-2296

FOREWORD

Since the implementation of the National Bridge Inspection Program in 1971, State Departments of Transportation have invested significant resources to evaluate the condition of their bridges. These inspections are primarily conducted within the context of the National Bridge Inspection Standards that require reporting of bridge condition in a standardized format. This standardized format uses a uniform set of condition ratings to describe the condition of a bridge. Key elements of the inspection include the condition ratings for the deck, superstructure, and substructure of the bridge. The assignment of condition ratings to elements of the bridge is used to measure bridge performance at the national level, to forecast future funding needs, to determine the distribution of funds between States, and to evaluate if a particular bridge renovation project qualifies for Federal assistance. Obviously, the accuracy of the condition ratings is important to ensure that FHWA programs for funding bridge construction and renovation are equitable and meet the goal of reducing the number of deficient bridges.

The accuracy and reliability of the inspection process that results in condition ratings for Highway Bridges has not been researched previously. This report documents the findings of the first comprehensive study of the inspection process since the adoption of the National Bridge Inspection Standards. The study provides overall measures of the reliability and accuracy of bridge inspection, identifies factors that may influence the inspection results, and determines what procedural differences exist between various State inspection programs. This report will be of interest to bridge engineers, designers, and inspectors who are involved with the inspection of our Nation's highway bridges.

T. Paul Teng, P.E.
Director, Office of Infrastructure
Research and Development

NOTICE

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16. Abstract

Visual Inspection is the predominant nondestructive evaluation technique used in bridge inspections. However, since implementation of the National Bridge Inspection Standards in 1971, a comprehensive study of the reliability of Visual Inspection as it relates to highway bridge inspections has not been conducted. The goals of the study include: providing overall measures of the accuracy and reliability of Routine and In-Depth Visual Inspections, studying the influence of several key factors that affect Routine and In-Depth Inspections, and studying the differences between State inspection procedures and reports.

Ten inspection tasks were performed at seven test bridges using State bridge inspectors. The sample of participating inspectors included 49 inspectors from 25 State agencies. Inspectors were provided with common information, instruction, and tools. Inspector characteristics were measured through self-report questionnaires, interviews, and direct measurements.

Routine Inspections were completed with significant variability, and the Condition Ratings assigned varied over a range of up to five different ratings. It is predicted that only 68 percent of the Condition Ratings will vary within one rating point of the average, and 95 percent will vary within two points. Factors that appeared to correlate with Routine Inspection results include Fear of Traffic; Visual Acuity and Color Vision; Light Intensity; Inspector Rushed Level; and perceptions of Maintenance, Complexity, and Accessibility.

In-Depth Inspections using Visual Inspection alone are not likely to detect or identify the specific types of defects for which the inspection is prescribed, and may not reveal deficiencies beyond those that could be noted during a Routine Inspection. The overall thoroughness with which inspectors completed one of the In-Depth tasks tended to have an impact on the likelihood of an inspector detecting weld crack indications. Other factors that may be related to In-Depth Inspection accuracy include: time to complete inspection, comfort with access equipment and heights, structure complexity and accessibility, viewing of welds, flashlight use, and number of annual inspections performed.

The State procedural and reporting tasks indicated that most States follow similar procedural and reporting criteria. Several inconsistencies were noted with the use of the element-level inspection systems, but it is not known if these variations are the result of State practices or inspector use. Deck delamination surveys were found to have significant variability, with only a few teams performing a delamination survey as part of the Routine Inspection.

This volume is the second in a series of two. The other volume in the series is: FHWA-RD-01-020, Volume I: Final Report

17. Key Words	18. Distribution Statement
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Unclassified	Unclassified	376	

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: Volumes greater than 1000 l shall be shown in m^3.				
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celcius temperature	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.71	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact)		
°C	Celcius temperature	1.8C + 32	Fahrenheit temperature	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

* SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.

(Revised September 1993)

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APPENDIX A. STATE, COUNTY, AND CONTRACTOR SURVEY FORMS

Please answer all questions in this voluntary survey to the best of your ability. Note that some questions may require you to respond as if you were responsible for your state's bridge inspection unit. If you wish to comment further on any question(s) or qualify your answer, feel free to include additional sheets or use the margins. Upon completion of the study, participants will receive a draft of compiled responses.

Any questions regarding this survey should be addressed to Mr. Dennis Rolander at the NDE Validation Center at (703) 285-1133. Return the completed questionnaire by **January 29, 1998** by faxing to (703) 285-1175 or mailing to:

NDE Validation Center – HNR-20
State of the Practice Survey NDE/Visual Inspection
6300 Georgetown Pike
McLean, VA 22101-2296

ATTN: Dennis Rolander

Questionnaire completed by: ______________________________
Position/Title: ______________________________
Address: ______________________________
____
City/State/Zip: ______________________________
Phone No.: ______________ Fax No.: ______________
Email Address: ______________________________

Section 1 – Composition of Bridge Inspection Team for Visual Inspection

1. Are your bridge inspections completed by Department of Transportation (DOT) staff or by outside Contractors? *(circle one)*

   Only DOT staff   Only Contractors   Both DOT staff and Contractors

2. If the answer to Question 1 is "Both DOT staff and Contractors," in what situations are Contractors utilized? *(mark all that apply)*

   _____ Routine inspections
   _____ Fracture critical inspections
   _____ Advanced NDE techniques
   _____ Complex structures
   _____ Structures with complex traffic control situations
   _____ Underwater inspections
   _____ Other *(please describe below)*

   ____
   ____

3. For the following hypothetical bridge, how many people would make-up a field inspection team (excluding traffic control personnel), and how much time (in man-hours) would be budgeted?

   Twenty-year old, two-span bridge carrying two-lane road (medium ADT) over a small creek, maximum height above the creek is 20 ft.

   Superstructure: Steel, four-girder superstructure (rolled shapes); welded flange cover plates; concrete deck.

   Substructure: Concrete abutments, a single three-column concrete pier (with pier cap) out of the normal watercourse.

   People: __________

   Man-hours: __________

4. What are the minimum, maximum, and typical numbers of personnel that would make up a bridge inspection team (excluding traffic control personnel)?

   Minimum: __________

   Maximum: __________

   Typical: __________

5. Estimate the percentage of bridge inspections completed with a registered Professional Engineer (PE) **on-site**? *(circle one)*

   0-20%   21-40%   41-60%   61-80%   81-100%

6. When a PE is included as part of the on-site inspection team, what conditions would dictate his/her presence?

   ____

   ____

7. Please indicate the average number of years of experience in bridge inspection at each of the following positions. *(circle the appropriate responses)*

   Team Leader:

   0-5 years & PE   5-10 years   More than 10 years

   Other team members:

   0-5 years   5-10 years   More than 10 years

Section 2 – Impact of Administrative Requirements on Visual Inspection

1. If additional resources were made available for bridge inspection, please indicate how you might allocate those additional resources (for example, increased time per inspection, increased use of NDE methods, increased use of bridge inventory management software, etc.)?

   ____

   ____

   ____

2. Approximately how many bridge inspectors are in your bridge inspection unit?

   1-5   6-10   11-15   16-20   21-25   26-30   31-40   41-50   More than 50

3. What type of training do you require of bridge inspectors? *(mark all that apply)*

Team leaders:

_____ Associate's Degree CE Technology
_____ Bachelor's Degree CE
_____ Stream Stability Course
_____ Bridge Inspector's Training Course
_____ Fracture Critical Inspection Course
_____ Other Training Courses *(please specify)*

____

____

Other team members:

_____ Associate's Degree CE Technology
_____ Bachelor's Degree CE
_____ Stream Stability Course
_____ Bridge Inspector's Training Course
_____ Fracture Critical Inspection Course
_____ Other Training Courses *(please specify)*

____

____

4. Could you suggest any changes in administrative or inspection procedure or policy that may improve inspection performance? Explain.

____

____

____

5. Do you test the vision of inspectors (with corrective lenses if necessary)? Yes No

6. For a given bridge, are copies of previous inspection reports made available to the inspectors prior to arriving at the bridge site? *(circle one)* Yes No

7. Are inspectors permitted to use copies of previous inspection reports at the bridge site? *(circle one)* Yes No

8. Who determines the order of field inspection tasks? *(Mark the most appropriate response)*

_____ "Management" provides a checklist to the on-site team to organize the inspection process.
_____ Individual inspectors on-site set the inspection process.

9. Approximately how many bridges are inspected by your organization **each year**? __________

10. What measures do you have in place to assure quality inspections?

____

____

____

____

11. Please describe any recent accomplishments of your bridge inspection program. (For example, an innovative inspector training program, successful implementation of new NDE technologies, identification of potentially life-threatening conditions, etc.).

____

____

____

____

Section 3 – Current and Future Use of NDE Techniques

1. Do you have any American Society for Nondestructive Testing (ASNT) Level III Inspectors on staff? *(circle one)*

   Yes No

   If so, what method(s) are they certified for? *(check all those that apply)*

   _____ Acoustic Emission (AE)
   _____ Electromagnetic Testing (ET)
   _____ Leak Testing (LT)
   _____ Liquid Penetrant Testing (PT)
   _____ Magnetic Particle Testing (MT)
   _____ Neutron Radiographic Testing (NRT)
   _____ Radiographic Testing (RT)
   _____ Thermal/Infrared Testing (TIR)
   _____ Ultrasonic Testing (UT)
   _____ Vibration Analysis Testing (VA)
   _____ Visual Testing (VT)

   If applicable, are these ASNT Level III Inspectors routinely used in field situations? *(circle one)*

   Yes No

2. Mark any certifications which the typical Bridge Inspection Team Member may hold. *(Mark all that apply. Note that NICET refers to the National Institute for Certification In Engineering Technologies (NICET) Bridge Safety Inspection.)*

Team Leader	Other Team Members
_____ PE License	_____ PE License
_____ ASNT Level I	_____ ASNT Level I
_____ ASNT Level II	_____ ASNT Level II
_____ ASNT Level III	_____ ASNT Level III
_____ NICET Level I	_____ NICET Level I
_____ NICET Level II	_____ NICET Level II
_____ NICET Level III	_____ NICET Level III
_____ NICET Level IV	_____ NICET Level IV
_____ Other ____________________	_____ Other ____________________

3. What NDE techniques are currently utilized on bridges under your jurisdiction? *(mark all that apply)*

Steel:

Acoustic Emission	Eddy Current	Other Electromagnetic Testing
Liquid Penetrant	Magnetic Particle	Radiography
Thermal/Infrared	Ultrasonic	Vibration Analysis
Visual Inspection	Other ____________________	

Concrete:

Acoustic Emission	Cover Meters/Pachometers	Electrical Potential Measurements
Mechanical Sounding (chain drag)	Radar	Radiography
Rebound Hammer	Thermal/Infrared	Ultrasonics (Pulse Velocity)
Ultrasonics (Impact Echo)	Vibration Analysis	Visual Inspection

Other ____________________

Timber:

Acoustic Emission	Mechanical Sounding	Moisture Meter
Radiography	Stress Wave Analysis	Visual Inspection

Other ______________________________

Other Materials:

Material/Technique

1)

2)

3)

4. Of these NDE techniques, which method do you use most often for each material?

   Steel: ______________________________

   Concrete: ______________________________

   Timber: ______________________________

   Other Materials: ______________________________

5. Have you stopped using any NDE techniques due to unreliable performance or for any other reason? If so, which techniques and why?

   ____

   ____

   ____

   ____

   ____

6. What general area of NDE applications would you like to see more research into? *(mark one)*

   ___ Concrete decks

   ___ Concrete superstructure

   ___ Steel superstructure

   ___ Prestressed concrete superstructure

   ___ Timber decks/timber substructure

In conjunction with the development of the Federal Highway Administration's new NDE Validation Center, we plan to ask bridge inspection teams to participate in various visual inspection benchmark tests. The information gathered during these "hands-on" benchmark tests will provide bridge inspectors with valuable information about the factors affecting the reliability of visual inspection. The goal of this survey and the follow-up visual inspection tests is to help the bridge inspection community to perform more reliable bridge inspections. **Would you be willing to participate in the "hands-on" study?**

Thank you for your time in completing this questionnaire. Your answers will allow the NDE Validation Center team to focus their efforts in the areas that will benefit the bridge inspection community the most.

Please answer all questions in this voluntary survey to the best of your ability. Note that some questions may require you to respond as if you were responsible for your county's bridge inspection unit. If you wish to comment further on any question(s) or qualify your answer, feel free to include additional sheets or use the margins. Upon completion of the study, participants will receive a draft of compiled responses.

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ATTN: Dennis Rolander

Questionnaire completed by: ____________________
Position/Title: ____________________
Address: ____________________
____
City/State/Zip: ____________________
Phone No.: ____________ Fax No.: ____________
Email Address: ____________

Section 1 – Composition of Bridge Inspection Team for Visual Inspection

1. Are your bridge inspections completed by county personnel, state personnel, or by Contractors? *(circle one)*

   County Personnel   State Personnel   Contractors   Blend of three

2. If non-county personnel are used for bridge inspections in Question 1, in what situations are they involved? *(mark all that apply)*

   ___ Routine Inspections
   ___ Fracture Critical Member Inspections
   ___ Advanced NDE techniques
   ___ Complex structures
   ___ Structures with complex traffic control situations
   ___ Underwater inspections
   ___ Other *(please describe below)*

   ____
   ____

3. For the following hypothetical bridge, how many people would make-up a field inspection team (excluding traffic control personnel), and how much time (in man-hours) would be budgeted?

Twenty-year old, two-span bridge carrying two-lane road (medium ADT) over a small creek, maximum height above the creek is 20 ft.

Superstructure: Steel, fabricated four-girder superstructure (rolled shapes); welded flange cover plates; concrete deck.

Substructure: Concrete abutments, a single three-column concrete pier (with pier cap) out of the normal watercourse.

People: ______________
Man-hours: ______________

4. What are the minimum, maximum, and typical numbers of personnel that would make up a bridge inspection team (excluding traffic control personnel)?

Minimum: ______________
Maximum: ______________
Typical: ______________

5. Estimate the percentage of bridge inspections completed with a registered Professional Engineer (PE) **on-site**? *(circle one)*

0-20% 21-40% 41-60% 61-80% 81-100%

6. When a PE is included as part of the on-site inspection team, what conditions would dictate his/her presence?

____
____

7. Please indicate the average number of years of experience in bridge inspection at each of the following positions *(circle the appropriate response)*.

Team Leader:
0-5 years (& PE) 5-10 years More than 10 years

Other team members:
0-5 years 5-10 years More than 10 years

Section 2 – Impact of Administrative Requirements on Visual Inspection

1. If additional resources were available for bridge inspection, please indicate how you might allocate those additional resources (for example, increased time per inspection, increased use of NDE methods, increased use of bridge inventory management software, etc.)?

____
____
____

2. Approximately how many bridge inspectors are in your bridge inspection unit?

1-5 6-10 11-15 16-20 21-25 26-30 31-40 41-50 More than 50

3. What type and how much training do you require of bridge inspectors? *(mark all that apply)*

Team leaders:

_____ Associate's Degree CE Technology
_____ Bachelor's Degree CE
_____ Stream Stability Course
_____ Bridge Inspector's Training Course
_____ Fracture Critical Inspection Course
_____ Other Training Courses *(please specify)*

Other team members:

_____ Associate's Degree CE Technology
_____ Bachelor's Degree CE
_____ Stream Stability Course
_____ Bridge Inspector's Training Course
_____ Fracture Critical Inspection Course
_____ Other Training Courses *(please specify)*

4. Could you suggest any changes in administrative or inspection procedure or policy that may improve inspection performance? Explain.

5. Do you test the vision of the inspectors (with corrective lenses if necessary)? Yes No

6. For a given bridge, are copies of previous inspection reports made available to the inspectors prior to arriving at the bridge site? *(circle one)* Yes No

7. Are inspectors permitted to use copies of previous inspection reports at the bridge site? *(circle one)* Yes No

8. Who determines the order of field inspection tasks? *(Mark the most appropriate response)*

_____ "Management" provides a checklist to the on-site team to organize the inspection process.
_____ Individual inspectors on-site set the inspection process.

9. Approximately how many bridges are inspected by your organization **each year**? _________

10. What measures do you have in place to assure quality inspections?

11. Please describe any recent accomplishments of your bridge inspection program. (For example, an innovative inspector training program, successful implementation of new NDE technologies, identification of potentially life-threatening conditions, etc.).

Section 3 – Current and Future Use of NDE Techniques

1. Do you have any American Society for Nondestructive Testing (ASNT) Level III Inspectors on staff? *(circle one)*

   Yes No

   If so, what method(s) are they certified for? *(check all those that apply)*

   _____ Acoustic Emission (AE)
   _____ Electromagnetic Testing (ET)
   _____ Leak Testing (LT)
   _____ Liquid Penetrant Testing (PT)
   _____ Magnetic Particle Testing (MT)
   _____ Neutron Radiographic Testing (NRT)
   _____ Radiographic Testing (RT)
   _____ Thermal/Infrared Testing (TIR)
   _____ Ultrasonic Testing (UT)
   _____ Vibration Analysis Testing (VA)
   _____ Visual Testing (VT)

   If applicable, are these ASNT Level III Inspectors routinely used in field situations? *(circle one)*

   Yes No

2. Mark any certifications which the typical Bridge Inspection Team Member may hold. *(Mark all that apply. Note that NICET refers to the National Institute for Certification in Engineering Technologies (NICET) Bridge Safety Inspection.)*

Team Leader	Other Team Members
______ PE License	______ PE License
______ ASNT Level I	______ ASNT Level I
______ ASNT Level II	______ ASNT Level II
______ ASNT Level III	______ ASNT Level III
______ NICET Level I	______ NICET Level I
______ NICET Level II	______ NICET Level II
______ NICET Level III	______ NICET Level III
______ NICET Level IV	______ NICET Level IV
______ Other ______________	______ Other ______________

3. What NDE techniques are currently utilized on bridges under your jurisdiction? *(mark all that apply)*

   Steel:

Acoustic Emission	Eddy Current	Other Electromagnetic Testing
Liquid Penetrant	Magnetic Particle	Radiography
Thermal/Infrared	Ultrasonic	Vibration Analysis
Visual Inspection	Other ______________	

   Concrete:

Acoustic Emission	Cover Meters/Pachometers	Electrical Potential Measurements
Mechanical Sounding (chain drag)	Radar	Radiography
Rebound Hammer	Thermal/Infrared	Ultrasonics (Pulse Velocity)
Ultrasonics (Impact Echo)	Vibration Analysis	Visual Inspection
Other ______________		

Timber:

Acoustic Emission	Mechanical Sounding	Moisture Meter
Radiography	Stress Wave Analysis	Visual Inspection

Other ____

Other Materials:

Material/Technique

1)

2)

3)

4. Of these NDE techniques, which method is used most often for each material?

Steel: ____

Concrete: ____

Timber: ____

Other Materials: ____

5. Have you stopped using any NDE techniques due to unreliable performance or any other reason? If so, which techniques and why?

____

____

____

____

____

6. What general area of NDE applications would you like to see more research into? *(mark one)*

___ Concrete decks

___ Concrete superstructure

___ Steel superstructure

___ Prestressed concrete superstructure

___ Timber decks/timber superstructure

Thank you for your time in completing this questionnaire. Your answers will allow the NDE Validation Center team to focus their efforts in the areas that will benefit the bridge inspection community the most.

Please answer all questions to the best of your ability. Note that some questions may require you to respond as if you were responsible for all bridge inspections done by your company. If you wish to comment further on any question(s) or qualify your answer, feel free to include additional sheets or use the margins. Upon completion of the study, participants will receive a draft of the compiled responses.

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ATTN: Dennis Rolander

Questionnaire completed by: ______________________
Position/Title: ______________________
Address: ______________________
____
City/State/Zip: ______________________
Phone No.: ______________ Fax No.: ______________
Email Address: ______________

Section 1 – Composition of Bridge Inspection Team for Visual Inspection

1. What types of bridge inspection services does your company perform? *(mark all that apply)*
   ___ Routine Inspections
   ___ Fracture Critical Member Inspections
   ___ Advanced NDE techniques
   ___ Complex structures
   ___ Structures with complex traffic control situations
   ___ Underwater inspections
   ___ Other *(please describe below)*

   ____
   ____

2. For the following hypothetical bridge, how many people would make-up a field inspection team (excluding traffic control personnel), and how much time would be budgeted?

   Twenty-year old, two-span bridge carrying two-lane road (medium ADT) over a small creek, maximum height above the creek is 20 ft.
   Superstructure: Steel, fabricated four-girder superstructure (rolled shapes); welded flange cover plates; concrete deck.
   Substructure: Concrete abutments, a single three-column concrete pier (with pier cap) out of the normal watercourse.

   People: ______________
   Man-hours: ______________

3. What are the minimum, maximum, and typical numbers of personnel that would make up a bridge inspection team (excluding traffic control personnel)?

Minimum: ________________
Maximum: ________________
Typical: ________________

4. Estimate the percentage of bridge inspections completed with a registered Professional Engineer (PE) **on-site**? *(circle one)*

0-20%   21-40%   41-60%   61-80%   81-100%

5. When a PE is included as part of the on-site inspection team, what conditions would dictate his/her presence?

____

____

6. Please indicate the average number of years of experience in bridge inspection at each of the following positions. *(circle the appropriate response)*

Team Leader:
0-5 years & PE   5-10 years   More than 10 years

Other team members: *(indicate number of inspectors)*
0-5 years   5-10 years   More than 10 years

Section 2 – Impact of Administrative Requirements on Visual Inspection

1. Approximately how many bridge inspectors are in your bridge inspection unit?

1-5   6-10   11-15   16-20   21-25   26-30   31-40   41-50   More than 50

2. Approximately how many bridges are inspected by your organization **each year**? __________

3. What type of training do you require of bridge inspectors? *(mark all that apply)*

Team leaders:
_____ Associate's Degree CE Technology
_____ Bachelor's Degree CE
_____ Stream Stability Course
_____ Bridge Inspector's Training Course
_____ Fracture Critical Inspection Course
_____ Other Training Courses *(please specify)*

____

____

Other team members:
_____ Associate's Degree CE Technology
_____ Bachelor's Degree CE
_____ Stream Stability Course
_____ Bridge Inspector's Training Course
_____ Fracture Critical Inspection Course
_____ Other Training Courses *(please specify)*

____

____

4. Could you suggest any changes in administrative or inspection procedure or policy that may improve inspection performance? Explain.

____

____

____

5. Do you test the vision of the inspectors (with corrective lenses if necessary)? *(circle one)* Yes No

6. For a given bridge, are copies of previous inspection reports made available to the inspectors prior to arriving at the bridge site? *(circle one)* Yes No

7. Are inspectors permitted to use copies of previous inspection reports at the bridge site? *(circle one)* Yes No

8. Who determines the order of field inspection tasks? *(Mark the most appropriate response)*
   _____ "Management" provides a checklist to the on-site team to organize the inspection process.
   _____ Individual inspectors on-site set the inspection process.

9. What measures do you have in place to assure quality inspections?

____

____

____

____

Section 3 – Current and Future Use of NDE Techniques

1. Do you have any American Society for Nondestructive Testing (ASNT) Level III Inspectors on staff? *(circle one)*
   Yes No

   If so, what method(s) are they certified for? *(check all those that apply)*
   _____ Acoustic Emission (AE)
   _____ Electromagnetic Testing (ET)
   _____ Leak Testing (LT)
   _____ Liquid Penetrant Testing (PT)
   _____ Magnetic Particle Testing (MT)
   _____ Neutron Radiographic Testing (NRT)
   _____ Radiographic Testing (RT)
   _____ Thermal/Infrared Testing (TIR)
   _____ Ultrasonic Testing (UT)
   _____ Vibration Analysis Testing (VA)
   _____ Visual Testing (VT)

If applicable, are these ASNT Level III Inspectors routinely used in field situations? *(circle one)*
Yes No

2. Mark any certifications which the typical Bridge Inspection Team Member may hold. *(Mark all that apply. Note that NICET refers to the National Institute for Certification in Engineering Technologies (NICET) Bridge Safety Inspection.)*

Team Leader	Other Team Members
______ PE License	______ PE License
______ ASNT Level I	______ ASNT Level I
______ ASNT Level II	______ ASNT Level II
______ ASNT Level III	______ ASNT Level III
______ NICET Level I	______ NICET Level I
______ NICET Level II	______ NICET Level II
______ NICET Level III	______ NICET Level III
______ NICET Level IV	______ NICET Level IV
______ Other ____________	______ Other ____________

3. What NDE techniques are currently utilized on bridges under your jurisdiction? *(mark all that apply)*

Steel:

Acoustic Emission	Eddy Current	Other Electromagnetic Testing
Liquid Penetrant	Magnetic Particle	Radiography
Thermal/Infrared	Ultrasonic	Vibration Analysis
Visual Inspection	Other ____________	

Concrete:

Acoustic Emission	Cover Meters/Pachometers	Electrical Potential Measurements
Mechanical Sounding (chain drag)	Radar	Radiography
Rebound Hammer	Thermal/Infrared	Ultrasonics (Pulse Velocity)
Ultrasonics (Impact Echo)	Vibration Analysis	Visual Inspection

Other ____________

Timber:

Acoustic Emission	Mechanical Sounding	Moisture Meter
Radiography	Stress Wave Analysis	Visual Inspection

Other ____________

Other Materials:

Material/Technique

1)

2)

3)

4. Of these NDE techniques, which method is used most often for each material?

Steel: ____________

Concrete: ____________

Timber: ____________

Other Materials: ____________

5. Have you stopped using any NDE techniques due to unreliable performance or any other reason? If so, which techniques and why?

____

____

____

____

____

6. What general area of NDE applications would you like to see more research into? *(mark one)*
___ Concrete decks
___ Concrete superstructure
___ Steel superstructure
___ Prestressed concrete superstructure
___ Timber decks/timber superstructure

In conjunction with the development of the Federal Highway Administration's new NDE Validation Center, we plan to ask bridge inspection teams to participate in various visual inspection benchmark tests. The information gathered during these "hands-on" benchmark tests will provide bridge inspectors with valuable information about the factors affecting the reliability of visual inspection. The goal of this survey and the follow-up visual inspection tests is to help the bridge inspection community to perform more reliable bridge inspections. **Would you be willing to participate in the "hands-on" study?**

Thank you for your time in completing this questionnaire. Your answers will allow the NDE Validation Center team to focus their efforts in the areas that will benefit the bridge inspection community the most.

APPENDIX B. COMPLETE RESPONSES TO ACCOMPLISHMENTS QUESTION

STATE RESPONSES

- (1) The inspection unit now has access to a servi-lift truck. (2) Emergency repairs were made to cracks in the steel beams on an Interstate bridge in [*the State*] as a result of inspection. (3) A deteriorated superstructure was replaced on an emergency basis in [*the State*].

- [*The State department of transportation [DOT]*] has recently initiated a research project with the [*State university*] to evaluate dispersive wave techniques for determining in situ pile lengths.

- Implemented use of laptop computers and digital cameras for all teams. A sign structure was removed after inspectors found cracks.

- Inspection routine format and results computerized for consistency and error-checked by cross-comparison.

- The implementation of a spreadsheet to track priority repairs needed and rehabilitation completed on bridge elements, followed by the field verification by the inspection team, has prevented loss of life.

- Bridge program inspections are in Pontis and NBI [*National Bridge Inventory*]. Laser-based clearance measuring device.

- (1) Development of observable bridge scour assessment procedure to determine scour criticality. (2) Development of new inspection forms and electronic data collection process. (3) Development and implementation of automated permit routing, analysis, permit [*illegible*] system to [*illegible*].

- [*State DOT*] has a bridge inspector certification program. Team leaders must meet all NBIS [*National Bridge Inspection Standards*] requirements in addition to passing a field proficiency test. Also, [*State DOT*] added a Level III NDT [*nondestructive testing*] inspector in 1996.

- QC/QA [*Quality Control/Quality Assurance*] Program is performing very well. Also, all inspectors are required to complete the NBI Manual 90 course. Fatigue cracking problem on [*Interstate*] over [*river*]. Two-girder system with floor beams (370+ fatigue cracks). Crack indications in truss pins on Route 11 over [*same river*]. Alternate support systems added.

- Innovative procedure for nondestructive testing of in-place pins of trusses and pin/hanger assemblies utilizing ultrasonic inspection equipment.

- Development and implementation of a Bridge Inspection Handbook (contains bridge inspection policies, procedures, directives). Development and implementation of an electronic inspection documentation and management system.

- Complete replacement of all pins statewide for pin and hanger details.

- Implementation of [*State*] roadway information management system. Purchase of laptops, digital cameras, and color printers for all inspection teams. Evaluated and are using Timber Decay Detecting Drill. Inspection team found and closed a timber bridge on the State system that was in danger of collapse.

- A 2-week training course of Bridge Inspectors Training Course in 1997. A safety class and CPR class for bridge inspection teams. A Stream Stability course in 1998.

- Use of NDE [*nondestructive evaluation*] to identify a working crack in a trunion shaft of a major Interstate lift span and successful replacement of the shaft under contract.

- Development of inspector critical finding guideline. Development of inspection frequency guideline.

- Improved reporting of inspection results to local agencies. Bridge repair lists placed on Internet for maintenance crews (with photographs). Using laptop inspection program with electronic photolog. Load testing of some bridges due to recently re-rating all State bridges. GIS for bridge database allows graphical depictions on State map of scour critical bridges, needed inspections, and inspection scheduling.

- Concrete pile PIT testing. Coastal scour hydrology/hydraulic studies. Use of scour monitoring equipment.

- The State Inspectors using dye-penetrant kits discovered a severe fatigue-cracking problem that led to a university research project to identify the cause and recommend procedures for repair. The State NBIS underwater inspectors this past year inspected all State bridges affected by two natural flood disasters that led to emergency actions to avoid failures due to scour and erosion. The State implemented a load test program to proof load rate bridges posted for 1 to 5 tons under legal limit to allow for removing the posting restriction where practical.

- Use of portable fathometers. Electronic element-level data collection.

- A number of bridges are closed each year based on findings. Underwater inspections have found threatening conditions twice.

- [*State DOT*] has implemented the Pontis BMS [*bridge management system*] with element inspections. [*State DOT*] is testing digital cameras and they are using automated inspection software.

- Implementation of automation software.

- [*State DOT*] has developed and implemented an Access-based computer program which is used by their inspectors, engineers, and managers to record inspection findings, to schedule inspections, and to schedule and track planned maintenance and repairs.

- Rope-climbing equipment and related training was provided during the last year.

- One inspector is Level III and two inspectors are Level II qualified (ASNT [*American Society for Nondestructive Testing*]).

- [*Written*] QA/QC procedure.

- [*State DOT*] is supplementing their traditional hydrographic methods by contracting for side-scan sonar services on those bridges which most concern them.

- Select structures on the Fracture-Critical Master List have been analyzed to determine if they are, in fact, fracture critical and also identify fracture-critical elements which should receive more in-depth inspections.

- [*State DOT*] recently got back on a 2-year schedule.

- All bridge inspectors are certified in Red Cross First Aid and CPR. All bridge inspectors are scuba certified for underwater inspections.

- NDE technologies are being used on pin/hanger connections. Consultant has been hired to perform the evaluations.

- [*State DOT*] uses rope-climbing techniques and equipment to inspect some bridges.

COUNTY RESPONSES

- Identifying areas of advanced decay or scour and closing the bridges to traffic until repaired.

- Changing over to Pontis bridge inspection techniques.

- Identified corrosion and subsequent settlement of a steel-beam bridge. Closed, repaired, and reopened bridge and finally constructed a new structure. Identified settlement in timber piles and corrected.

- Completed bridge scour rating on all bridges.

- Timely identification of bridges needing posting and/or closure.

- In 1995, [*County DOT*] noticed abutment problems on a wood trestle bridge. In 1996, when new bridge was under construction at new location, the abutment of the old bridge failed.

- Started using a new and more thorough field inspection form in the last 2 years.

- Develop repair list. Broken down by in-house or contractor and priority.

- Reporting of damaged bridge components. Inspection interval of every 2 years or more frequently if bridge warrants such.

- Identifying areas of advanced decay or scour, and closing the bridges to traffic.

- Developing a computerized bridge inspection inventory program.

- Removed 6 ft^2 of AC [*asphalt concrete*] overlay & partially removed concrete deck to expose rusted rebar on 28-ft by 610-ft bridge. Scheduled deck for replacement. [*County DOT*] has re-analyzed all timber and I-beam bridges, resulting in posting of 40 bridges.

- Compliment from FHWA [*Federal Highway Administration*] bridge inspector regarding problem bridges being scheduled into the DOT budget and program.

- [*County DOT*] has found major problems with three bridges carrying gravel roads over railroad tracks. [*County DOT*] has removed two and replaced them with at-grade crossings. [*County DOT*] regraded the roads and paid all expenses for the change.

- Scour-Critical.

- Enrollment of inspector in NHI [*National Highway Institute*] Bridge Inspection courses in Spring of 1999.

- Bridges are inspected on an almost daily basis by [*County*] truck drivers, motor patrol operators, and farmers. Reporting observed deficiencies of railings, signs, loss of backfill, etc.

- Annually, potential problems are discovered and addressed. [*County DOT*] has many bridges from 1800's.

- Bridges have been closed or severely limited to weight after inspections have discovered critical problems.

APPENDIX C. ADVANCE INFORMATION PACKAGE

Re: Visual Inspection Investigation Advance Information Package
DTFH61-96-C-00054
Refer to: HRDI

Dear Sir or Madam:

The purpose of this information package is to provide you with some important information in advance of your on-site participation in the Federal Highway Administration's Nondestructive Evaluation Validation Center Visual Inspection study. There are a few pieces of information that we want to bring to your attention. First, enclosed please find information regarding one of the tasks you will be completing. One of the tasks you will be asked to perform is the Routine Inspection of a low-volume bridge in accordance with your State procedures. To complete this task, it will be necessary for each inspector to review your State procedure for conduct of a Routine Inspection, and to generate all forms required for such an inspection. Additionally, you will find information related to the equipment that should be brought and what equipment will be provided. Also enclosed is information related to your schedule of on-site tasks and accommodations.

We would like to thank you in advance for your participation in this very important study. Your assistance will allow us to establish the current state of the bridge inspection practice. If you have any questions about the enclosed materials or about your visit in general, please feel free to contact me at (202) 493-3121 or via email at Brent.Phares@fhwa.dot.gov. If you have questions about your travel arrangements you should contact Ms. Fariba Parvizi at (202) 493-3118. Once again, thank you for your interest in the Nondestructive Evaluation Validation Center Visual Inspection study.

Sincerely,
NDE VALIDATION CENTER

Brent M. Phares
Research Engineer

BMP:eg

Encl.

Summary of Items Included with this Package:

- General Information for Visual Inspection Study
- Map to TFHRC
- Sample Data forms for a Routine Inspection
- Plans for Van Buren Rd. Bridge (pages 10-13)
- Sample Travel Expense Voucher

Checklist to do before Visit:

- ❑ Indicate Originating Airport to Ms. Parvizi (if not coming by car).
- ◫ Send to the NDEVC a copy of a typical inspection form used by your DOT for the NBIS inspections. Please send this form in advance to: NDE Validation Center
  6300 Georgetown Pike
  McLean, VA 22101
  Attn: Dr. Brent Phares.
- ❑ Receive Confirmation Letter with hotel information and confirmation numbers, telephone numbers, maps, and meeting information.
- ❑ Bring Personal Safety Equipment (Safety shoes, safety glasses, gloves, and other protective clothing).
- ◫ Bring Forms required to perform your State's normal NBIS inspection for the Van Buren Rd. Bridge.

Visual Inspection Study

Information Packet

Federal Highway Administration
U.S. Department of Transportation

Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101

WJE

Wiss, Janney, Elstner Associates, Inc.
Engineers, Architects, Material Scientists

225 Peachtree Street, N.E., Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 fax: (404) 577-0066

General Information for NDE Validation Center Visual Inspection Study

The goal of the study of Visual Inspection is to assess Visual Inspection as applied to highway bridges. To accomplish this, the NDE Validation Center (NDEVC) will use a cross-section of bridge inspectors to perform eleven different inspection tasks consisting of both Routine Inspection and In-Depth Inspection techniques.

Most inspection tasks will be performed individually, but for safety and the sake of the experiment, each visiting inspector will be teamed with an observer from the NDE Validation Center. It is important to remember throughout your participation that we are not "testing" individual inspectors. The purpose of the study is to evaluate the overall effectiveness of the visual inspection process. Anonymity of each inspector will be ensured by the use of randomly generated inspector numbers to track data.

Ten of the eleven tasks involve individual inspectors performing Routine or In-Depth Inspections. The other task is team oriented; designed to observe normal State inspection practices without any guidance from the observers. This last task will require some advance preparation, and more information is presented in a separate section below. **As part of this task, please send to the NDEVC (prior to your visit) a copy of a typical inspection form used by your inspection department for Routine Inspection.**

Testing will be performed in three areas:

- Routine Inspections
- In-Depth Inspections
- Inspector characterizations

Data will be collected in four forms:

- Lab testing (vision testing and written questionnaire)
- Oral questionnaires before and after each task
- Observations recorded by the observer during the inspection
- Data forms for the inspection report

To ensure that all of the inspectors use consistent terms, and understand exactly what will be expected, the following will provide some specific definitions for the Visual Inspection study.

Task Definitions

Routine Inspection

The *AASHTO Manual for Condition Evaluation 1994* defines Routine Inspection as:

> *... a regularly scheduled inspection consisting of observations and/or measurements needed to determine the physical and functional condition of the bridge, to identify any changes from 'Initial' or previously recorded conditions, and to ensure that the structure continues to satisfy present service requirements.*
>
> *The Routine Inspection must fully satisfy the requirements of the National Bridge Inspection Standards with respect to maximum inspection frequency, the updating of Structure Inventory and Appraisal data and the qualifications of the inspection personnel. These inspections are generally conducted from the deck; ground and/or water levels, and from permanent work platforms and walkways, if present. (AASHTO Manual, pgs 11-12).*

We will be using the above definition in our study.

The Routine Inspection appears to be the typical inspection used to satisfy NBIS inspection requirements. In order to conserve time, certain aspects of the typical NBIS inspection will be omitted from the inspections performed in this study. Some of the things that will be excluded from the inspections include: underwater stream profiles, gross dimension checks, and certain non-structural items like approach barriers, guardrails, and vertical clearance.

It is important for consistency within the experiment that the test bridges remain in the same condition throughout the experiment. As such, invasive procedures, even as small as chipping existing paint or brushing away dirt, will not be allowed. We ask that where these invasive procedures would be used in the experiment, that the inspector make a brief notation about what would normally be done, and where.

A sample of the data sheets to be used for this experiment is included with this packet.

In-Depth Inspection

The *AASHTO Manual for Condition Evaluation 1994* defines In-Depth Inspection as:

> *... a close-up, hands-on inspection of one or more members, above or below the water level to identify any deficiency(ies) not readily detectable using Routine Inspection procedures. Traffic control and special equipment, such as under-bridge inspection equipment, staging and workboats, should be provided to obtain access, if needed. (AASHTO Manual, pg. 12).*

We will be using this definition for our study.

Access equipment will be provided where required to reach the superstructure. For two of these tasks, a boom lift will be used to access the superstructure. Again, members will not be inspected below the water level. When needed, traffic control will be arranged by the NDEVC. The individual tasks will define exactly what members are to be inspected.

It is essential for the experiment that the test bridges remain in exactly the same condition throughout the experiment. As such, invasive procedures, even as small as chipping existing paint or removing dirt, will not be allowed. We ask that where these invasive procedures would be used in the experiment, that the inspector notifies his observer what would be done, and where.

Rating System

A rating system will be used that is very similar to the NBIS provisions. Although element-level, PONTIS-type inspections are typically performed by many states, this study will use the NBIS system for uniformity. This system uses a ranking of 0-9 to describe condition. For consistency, we ask that this rating system be used, with the definitions provided below.

N	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION – no problems noted.
7	GOOD CONDITION – some minor problems.
6	SATISFACTORY CONDITION – structural elements show minor deterioration.
5	FAIR CONDITION – all primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
4	POOR CONDITION – advanced section loss, deterioration, spalling, or scour.
3	SERIOUS CONDITION – loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.

2 CRITICAL CONDITION – advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.

1 "IMMINENT" FAILURE CONDITION – major deterioration or section loss present in critical structural components, or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put bridge back in light service.

0 FAILED CONDITION – out of service; beyond corrective action.

Items provided during visit

Where vertical access is required, ladders, scaffolding, or lifts will be provided. An inspector's tool bag will also be provided, and will include:

- Clipboards
- Flashlights
- Masonry hammer (for sounding purposes only)
- Chain
- Measuring tapes
- Binoculars
- Plumb bob
- String
- Small clamps

In order to preserve identical conditions for all inspectors, the use of inspection picks and jackknives is not allowed.

Safety harnesses, traffic vests, and hard hats will be provided by the NDEVC.

Items to bring

Normal attire appropriate for bridge inspections is expected. Personal safety equipment is expected to be provided by the individual inspectors, including safety shoes, glasses, gloves, and other personal protective clothing.

ADVANCE INFORMATION FOR TASK 3

One of the tasks that each inspector will be asked to perform is the Routine Inspection of a low (less than 50) ADT bridge. In the overall Visual Inspection Scope of Work, this Routine Inspection is called Task 3. Again, the *AASHTO Manual for Condition Evaluation 1994* defines a Routine Inspection as:

> *...a regularly scheduled inspections consisting of observations and/or measurements needed to determine the physical and functional condition of the bridge, to identify any changes from 'Initial' or previously recorded conditions, and to ensure that the structure continues to satisfy present service requirements." (AASHTO Manual, pg 12).*

The objective of this task is to observe differences in the States' inspection procedures. Included with this package is a set of plans (labeled pages 10-13) for the bridge to be inspected as part of Task 3, and the NBIS coding information from a previous inspection. Your team will be asked to perform **your agency's routine state inspection** on this bridge, with no input from the observers. At the conclusion of the inspection, the NDEVC would like a copy of the field report.

IMPORTANT: Please plan and prepare for this inspection as if it was a bridge in your State and part of your normal inspection workload. Generate in advance any forms that would be required to complete an inspection report in your State's format, keeping in mind that you will be asked to submit a final hard copy report.

Bridge description: The Van Buren Road Bridge over the Quantico Creek was built around 1960, and consists of three spans, each simply supported with a span length of approximately 60 ft. The overall bridge length is 182-ft 7-in. with an overall width of 28-ft 0-in. The deck is 7-in.-thick cast-in-place reinforced concrete supported by four wide-flange stringers, which act compositely with the deck. The steel stringers are reinforced with tapered-end, welded, cover plates. The superstructure is supported by reinforced concrete piers and abutments founded on spread footings or steel H-piles. The bridge was designed for HS5-44 loading.

Items to bring
Normal attire appropriate for bridge inspections is expected. Safety shoes, glasses, gloves, and other personal protective clothing will be expected. (Safety vests and hard hats will be provided by the NDEVC.)

If laptop computers or digital cameras are used for normal routine inspections, please bring these items along if possible.

Items provided
Ladders will be provided to access the superstructure. An inspector's tool kit will be provided for use during the inspections, and will include:

- Clipboards
- Flashlights
- Masonry hammer
- Chain
- Measuring tapes
- Binoculars
- Plumb bob
- String
- Small clamps

Please refrain from bringing other inspection tools. In order to preserve identical conditions for all inspectors, the use of inspection picks and jackknives cannot be allowed. Traffic vests and hard hats will be provided by the NDEVC.

As mentioned above, if portable computers or digital cameras are used in the normal inspection process, please bring these items.

SCHEDULE

Activities are planned for a 2-½ day period. The schedule is organized to account for groups arriving in the Washington Metro area before 1 pm or after 1 pm. Those due to arrive before 1 pm should take a shuttle (Supershuttle, Washington Flyer, etc.) to our facilities, and the inspection program will commence that same day. Those due to arrive after 1 pm will be expected to take a shuttle to the hotel, and Day 1 of the inspection program will commence the following day after lunch. In the second scenario, we will plan to pick you up at your hotel at approximately 12:15 pm. Our facilities are at the Turner-Fairbank Highway Research Center (TFHRC) at 6300 Georgetown Pike, in McLean, VA. A map is included for your use.

Day 1 of the inspection program will be conducted at the NDEVC at TFHRC, followed by travel to Breezewood, Pennsylvania. Hotel rooms will be arranged by the NDEVC. Day 2 of the inspection program will take place at the Pennsylvania Turnpike Commission's Safety Testing and Research (STAR) Facility in Breezewood. Following these tasks, we will return to Northern Virginia. Once again, hotel rooms will be arranged by the NDEVC. Day 3 of the inspection program will take place at two bridges in Northern Virginia. At the conclusion of testing, the visiting inspectors will be returned either to the hotel or to the airport, depending on travel arrangements. Schematic schedules of tasks are presented below.

Schematic Schedule for inspectors arriving to the Washington Metro area before 1 pm.

	Day 1	Day 2	Day 3
Morning	Arrive at TFHRC. Finish preparations for Task 3.	Star Facility – Morning Inspection tasks.	Rt. 1 test bridge.
Afternoon	TFHRC NDEVC Lab: Introduction and preliminary inspector characterization. Travel to STAR Facility (PA).	Star Facility – Afternoon inspection tasks. Travel to No. Va.	Van Buren Rd. test bridge.

Schematic Schedule for inspectors arriving to the Washington Metro area after 1 pm.

	Travel Day	Day 1	Day 2	Day 3
Morning	Travel	Finish preparations for Task 3.	Star Facility – Morning Inspection tasks.	Rt. 1 test bridge.
Afternoon	Arrive Northern Virginia, take shuttle to hotel.	TFHRC NDEVC Lab: Introduction and preliminary inspector characterization. Travel to STAR Facility (PA).	Star Facility – Afternoon inspection tasks. Return to No. Va.	Van Buren Rd. test bridge.

Sample Data Form

Inspector ID: 000
Date: 5-10-99
Structure Type: STEEL, THRU-GIRDER

Task ---
Routine Inspection

OVERALL DECK CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: THE ASPHALT WEARING SURFACE PREVENTS VISUAL INSPECTION OF THE TOPSIDE OF DECK. THE STAY-IN-PLACE FORMS PREVENT VISUAL INSPECTION OF UNDERSIDE OF DECK. KEEP RATING SAME AS LAST INSPECTION

Deck Elements	Rating										Remarks
Wearing Surface	N	9	8	7	6	5	4	3	2	1	
Deck – Topside	N	9	8	7	6	5	4	3	2	1	NOT VISIBLE DUE TO W. SURFACE
Deck – Underside	N	9	8	7	6	5	4	3	2	1	NOT VISIBLE DUE TO S.I.P. FORMS
SIP Forms	N	9	8	7	6	5	4	3	2	1	
Curbs	N	9	8	7	6	5	4	3	2	1	INTEGRAL W/ TOP FLANGE OF GIRDER
Medians	N	9	8	7	6	5	4	3	2	1	
Sidewalks	N	9	8	7	6	5	4	3	2	1	
Parapets	N	9	8	7	6	5	4	3	2	1	
Railing	N	9	8	7	6	5	4	3	2	1	WEAK AXIS ORIENTATION
Expansion Joints	N	9	8	7	6	5	4	3	2	1	TRANSVERSE CRACKS IN WS @ B.H. ABUT.
Drainage System	N	9	8	7	6	5	4	3	2	1	NONE PROVIDED - NATURAL
Lighting	N	9	8	7	6	5	4	3	2	1	
Utilities	N	9	8	7	6	5	4	3	2	1	
	N	9	8	7	6	5	4	3	2	1	
	N	9	8	7	6	5	4	3	2	1	

Notes:

Inspector ID: 000

Task ---
Routine Inspection

OVERALL SUPERSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments:

Superstructure Elements					Rating						Remarks
Stringers	N	9	8	7	6	5	4	3	2	1	
Floorbeams	N	9	8	7	6	5	4	3	2	1	NO CRACKS AT WELDED PLATES
Floor System Bracing	N	9	8	7	6	5	4	3	2	1	
Multibeams	N	9	8	7	6	5	4	3	2	1	
Girders	N	9	8	7	6	5	4	3	2	1	SEE NOTE 1
Arches	N	9	8	7	6	5	4	3	2	1	
Cables	N	9	8	7	6	5	4	3	2	1	
Paint	N	9	8	7	6	5	4	3	2	1	LOCAL SCALING
Bearing Devices	N	9	8	7	6	5	4	3	2	1	ROCKERS HAVE HEAVY RUST
Connections	N	9	8	7	6	5	4	3	2	1	
Welds	N	9	8	7	6	5	4	3	2	1	
	N	9	8	7	6	5	4	3	2	1	
	N	9	8	7	6	5	4	3	2	1	

Timber Decay N/A
Concrete Deterioration N/A
Steel Corrosion MINOR SECTION LOSS
Collision Damage NONE
LL Deflection MINIMAL
Vibration MINIMAL
Member Alignment NO VISIBLE PROBLEMS
Utilities N/A

Notes: Note 1) 1/8" Pitting Lower 6" of D.S. GIRDER WEB, Full Length - outside face

Inspector ID: OOO

Task ---
Routine Inspection

OVERALL SUBSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

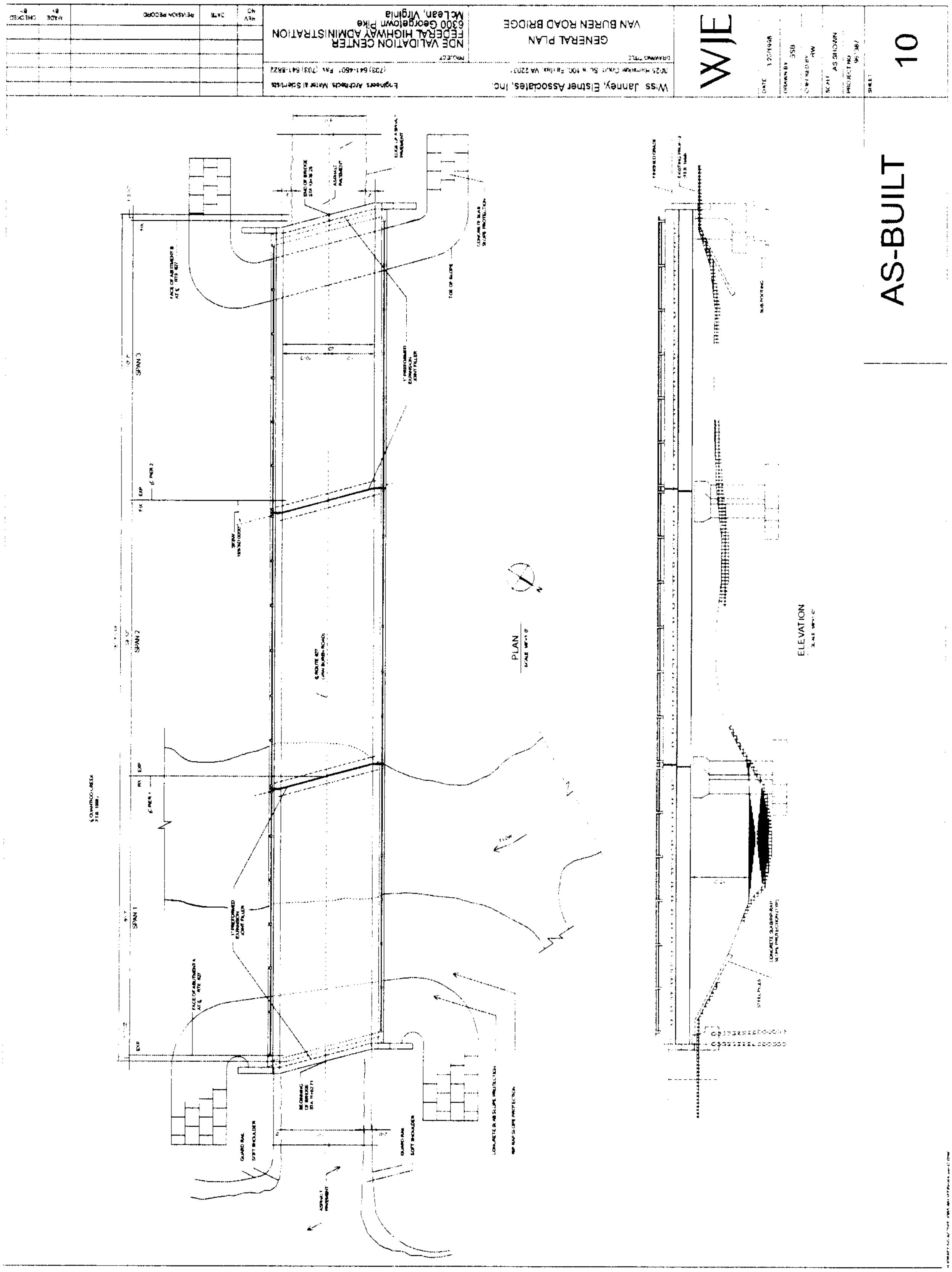
Comments: THE SUBSTRUCTURE IS IN FAIR CONDITION. IT HAS AREAS OF MINOR SPALLING, CRACKING, & DELAMINATION

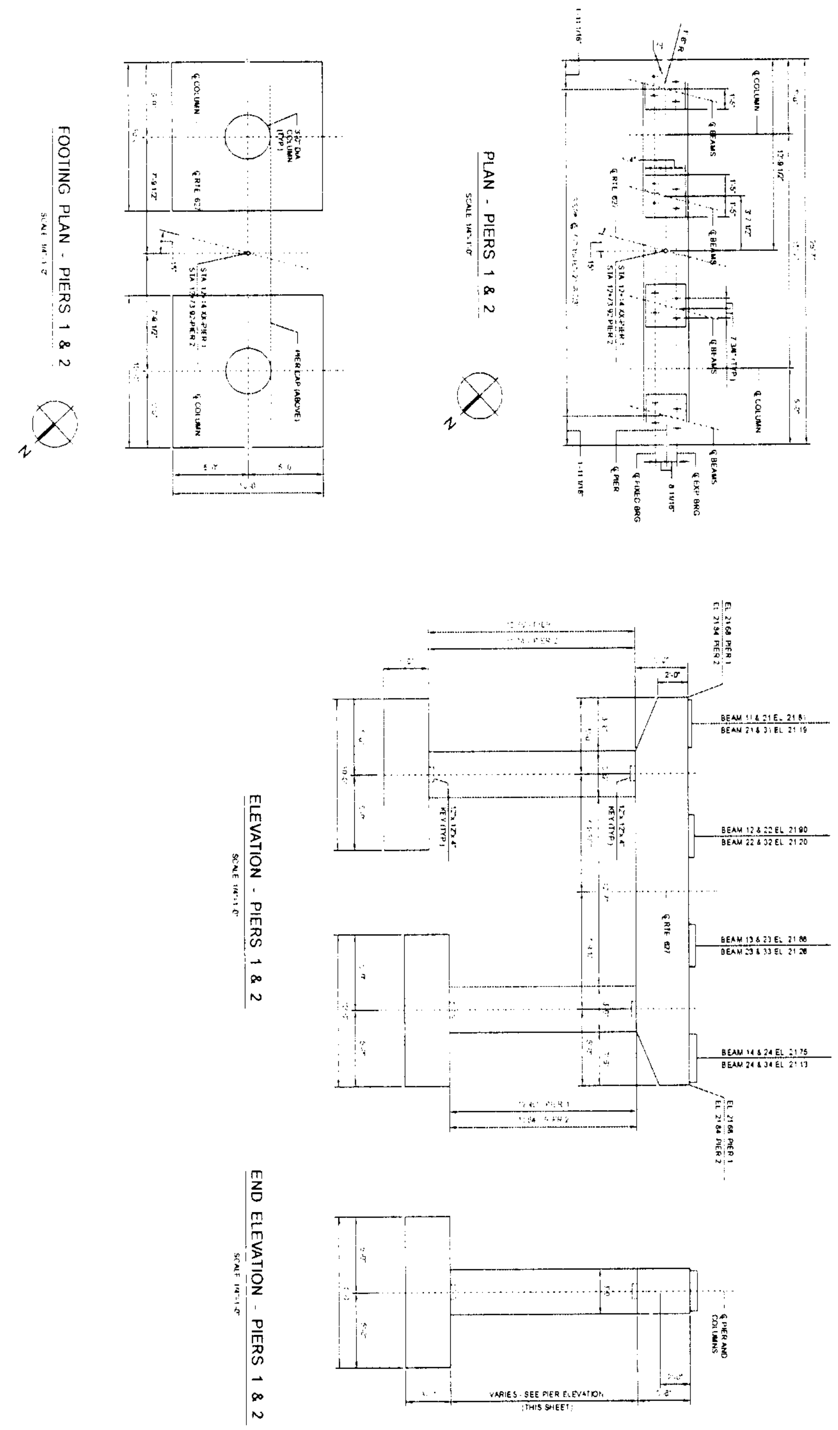
Substructure Elements	Rating										Remarks
Abutments	N	9	8	7	6	5	4	3	2	1	W. ABUTMENT ~ MINOR CRACKS, Delam, EFF.
Piles	N	9	8	7	6	5	4	3	2	1	NOT EVIDENT
Footing	N	9	8	7	6	5	4	3	2	1	NOT VISIBLE
Stem	N	9	8	7	6	5	4	3	2	1	MASONRY CAPPED W/R/F CONCRETE
Bearing Seat	N	9	8	7	6	5	4	3	2	1	MINOR SPALLS; DELAMINATION
Backwall	N	9	8	7	6	5	4	3	2	1	
Wingwalls	N	9	8	7	6	5	4	3	2	1	
Piers and Bents	N	9	8	7	6	5	4	3	2	1	
Piles	N	9	8	7	6	5	4	3	2	1	
Footing	N	9	8	7	6	5	4	3	2	1	
Columns/Stem	N	9	8	7	6	5	4	3	2	1	
Cap	N	9	8	7	6	5	4	3	2	1	
	N	9	8	7	6	5	4	3	2	1	
	N	9	8	7	6	5	4	3	2	1	

Scour/Undermining: 1' DEEP x 8' DIA. ADJACENT TO N END OF E. ABUTMENT
Settlement: NONE
Substructure Protection: N/A
Collision Damage: ~~N/A~~ NONE
High-water Mark: VISIBLE + OR - 1 FT. ABOVE NORMAL POOL.
Concrete Deterioration: MINOR SPALLS, DELAMINATION & CRACKING
Steel Corrosion: N/A
Paint: N/A

Notes:

Plans for Van Buren Road Bridge


Wiss, Janney, Elstner Associates, Inc.
Engineers Architects Materials Scientists
WJE
GENERAL PLAN
VAN BUREN ROAD BRIDGE
NDE VALIDATION CENTER
FEDERAL HIGHWAY ADMINISTRATION
6300 Georgetown Pike
McLean, Virginia
10
AS-BUILT
PLAN
ELEVATION
SPAN 1
SPAN 2
SPAN 3



AS-BUILT

WJE

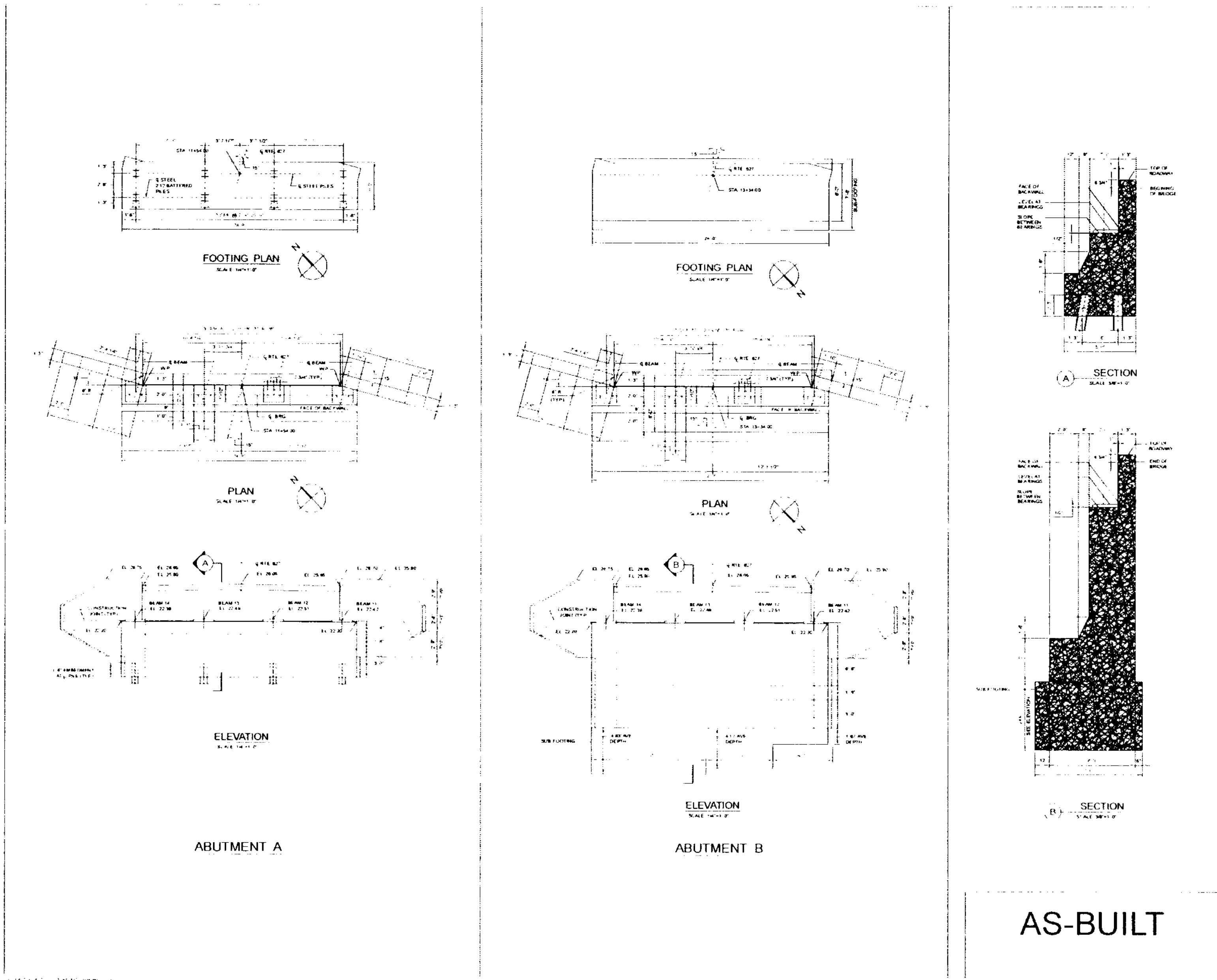
Wiss, Janney, Elstner Associates, Inc.
Engineers, Architects, Material Scientists
3025 Hamaker Court, Suit 100 Fairfax VA 22031
(703) 641-4601 Fax: (703) 641-8822

DRAWING TITLE
PIER 1 AND 2
VAN BUREN ROAD BRIDGE

PROJECT
NDE VALIDATION CENTER
FEDERAL HIGHWAY ADMINISTRATION
630 Georgetown Pike
McLean, Virginia

REV NO	DATE	REVISION RECORD	MADE BY	CHECKED BY

11



AS-BUILT

Wiss, Janney, Elstner Associates, Inc.
3025 Hemaker Court, Suite 100, Fairfax, VA 22031
Engineers, Architects, Material Scientists
(703) 641-4601 Fax (703) 641-8822

DRAWING TITLE
ABUTMENT A AND B
VAN BUREN ROAD BRIDGE

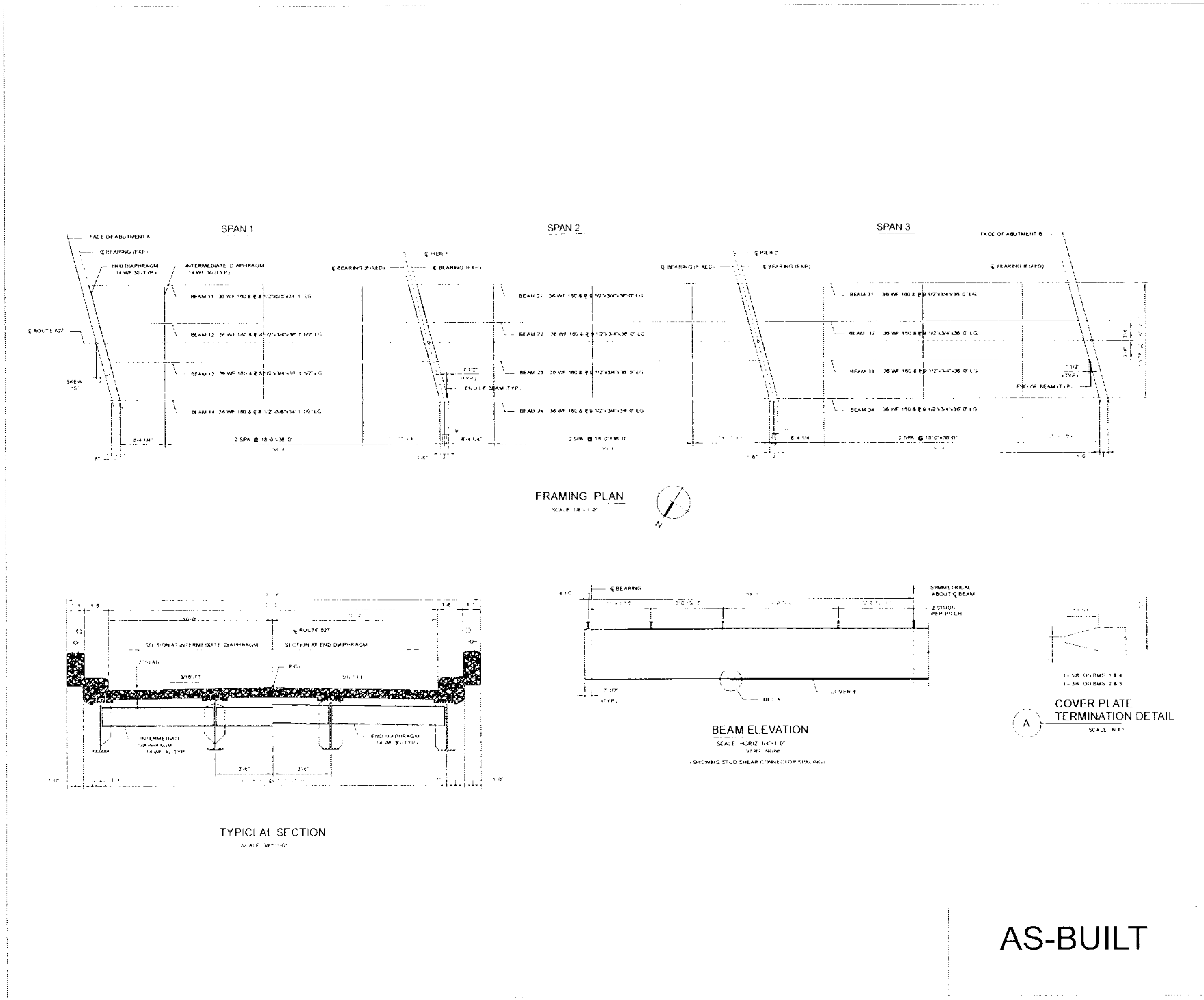
PROJECT
NDE VALIDATION CENTER
FEDERAL HIGHWAY ADMINISTRATION
6300 Georgetown Pike
Mc Lean, Virginia

REV NO	DATE	REVISION RECORD	MADE BY	CHECKED BY

WJE

DATE
DRAWN BY
CHECKED BY
SCALE AS SHOWN
PROJECT NO.
SHEET

12



Wiss, Janney, Elstner Associates, Inc
Engineers Architects Material Scientists
(703) 641-4601 Fax (703) 641-8822

FRAMING PLAN, TYPICAL SECTION AND BEAM ELEVATION
VAN BUREN ROAD BRIDGE

NDE VALIDATION CENTER
FEDERAL HIGHWAY ADMINISTRATION
6300 Georgetown Pike
Mc Lean, Virginia

WJE

DATE 1/20/1998

SCALE AS SHOWN

AS-BUILT

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APPENDIX D. SUMMARIES OF OVERALL BRIDGE CONDITIONS

DEFECT AND CONDITION SUMMARY FOR BRIDGE B521

DECK:

Wearing Surface: The wearing surface exhibits deterioration ranging from alligator cracking with debondment of the top asphalt layer to reflective pothole depressions. Cracking was primarily limited to the gutter areas. The surface has raveled and is pitted.

Rating [redacted]

Deck Underside: Approximately 30 to 40 percent of the deck underside showed tight alligator cracking with some efflorescence. A total of seven small spall areas were noted, with the total area of deterioration measuring less than 1.67 m^2.

Rating 5

Parapet: The superstructure doubles as the bridge rail/parapet and therefore is rated with the superstructure.

Rating N

Curbs: The curbs were generally sound, except near expansion joints where full-depth holes were noted at three locations. Holes measure approximately 150 mm in diameter.

Rating 5

Joints: Steel joint cover plates have been covered by asphalt. In general, the asphalt has debonded and created a uneven riding surface over the joints. Exposed joint cover plates showed surface corrosion with some pitting.

Rating 6

Drainage: None.

Rating N

Overall: Due to the asphalt overlay, the top of the deck could not be examined. The general lack of underside deck cracking suggests that widespread water penetration is not occurring.

Pothole depressions in the asphalt overlay suggest some potential top of deck distress.

Rating 5

SUPERSTRUCTURE:

Bearings: The bearings showed surface corrosion, with accumulated debris typically around the bearing base. The expansion bearing position was contrary to what would be expected for the temperature at the time of inspection, suggesting possible frozen bearings.

Rating 5

Joints: None.

Rating N

Floor Beams: In general, the floor beams were in good condition, with only minor surface corrosion and failed paint noted. However, the end floor beams exhibited considerably more surface corrosion and failed paint due to their proximity to the end joints. The end floor beam webs showed slight pitting.

Rating 5

Overall: The exterior surface of the principal girders was in satisfactory condition. The interior surface showed debris build-up on horizontal surfaces and resulting corrosion and paint failure. Past water leakage at floor beam-to-girder intersections had resulted in minor pitting (<1.5 mm) of the girder web. Sealant between the curb and principal girders has hardened and failed throughout.

Rating 5

SUBSTRUCTURE:

Wingwalls: The wingwalls were generally in good condition. The concrete deterioration was limited to surface staining, scaling, and minor spalls. Several tight cracks extending more than 1.22 m were noted. The shear key between the wingwall and abutment was fractured at the southeast and northeast wingwalls. Vine growth obscured portions of the wingwalls.

Rating 6

Abutments: The north abutment showed general water staining, with surface erosion and numerous 25-mm-diameter spalls at tie locations. A full-height vertical crack was noted, with several other cracks in the abutment backwall. The north abutment piers were in fair condition, with a 0.093-m^2 spall at the northeast pier. The south abutment showed similar water staining, with surface erosion and numerous 25-mm-diameter spalls. In addition, there were several areas of delamination (<0.56 m^2) and an exposed reinforcing bar. On the abutment backwall, behind the end floor beam, two large spalled areas were noted. The southeast abutment also showed a vehicle collision mark.

Rating 6

Overall: The generally good condition wingwalls and only general water staining in the abutments indicate that the substructure is in satisfactory condition.

Rating 6

DEFECT AND CONDITION SUMMARY FOR BRIDGE B101A

DECK:

Wearing Surface: The wearing surface in the eastbound lanes exhibits severe alligator cracking, with complete disintegration (raveling) of the top asphalt layer in a 150-mm to 305-mm strip between lanes. The westbound lanes and median exhibit block cracking, with alligator cracking in a 150-mm to 305-mm strip between lanes. Both shoulders exhibit block cracking (50 percent) mixed with heavily raveled areas (50 percent).

Rating 4

Deck Underside: The underside of the deck was generally in good condition, with deterioration primarily limited to the longitudinal joint at the bridge centerline. This deterioration consisted of severe freeze/thaw damage, spalling, efflorescence, and exposed, corroded reinforcement. Deterioration extended approximately 610 mm on each side of the joint to a depth of no more than 100 mm. Estimated deterioration at the joint was approximately 5.57 m^2. Additional deterioration included three small spalls and/or pop-outs, accounting for approximately 0.37 m^2 of deterioration.

Rating [redacted]

Parapets: The parapets, which are integral with the curbs, exhibit severe freeze/thaw damage, delaminations, cracking, and efflorescence, primarily at the curbs and within the top 125 mm of the parapet. Deterioration extends over roughly 45 percent of the parapet surface.

Rating [redacted]

Joints: Covered by asphalt. Longitudinal joint when viewed from underside was noted to have experienced extensive concrete deterioration and water leakage. This concrete deterioration is rated as part of the underside deck elements. A change in elevation between the deck and slab-on grade was noted at the eastbound approach joint.

Rating N

Drainage: None.

Rating N

Overall: Due to the asphalt overlay, the top of the deck could not be examined. The lack of underside deck cracking suggests that widespread water penetration is not occurring. However, the integral T-beams show cracking with efflorescence, which suggests otherwise. Overall deck rating is governed by severe asphalt deterioration.

Rating [redacted]

SUPERSTRUCTURE:

Bearings: Not visible.

Rating N

Joints: None.

Rating N

Diaphragms: The end diaphragms exhibited cracking with efflorescence primarily at construction joints and cold joints. Hairline cracking with efflorescence and delaminations were also noted.

Rating 5

Overall: T-beams showed limited cracking, delamination, efflorescence, and water infiltration on both of the bottom flange surfaces; although similar deterioration existed on the web surfaces, but to a lesser extent. This deterioration was more pronounced for edge beams and beams immediately adjacent to the longitudinal deck joint. Estimated quantities of concrete deterioration included 11.15 m^2 at the bottom flange surface and 1.86 m^2 at the web surface.

Rating [redacted]

SUBSTRUCTURE:

Wingwalls: The wingwalls are generally in fair to good condition. Some spalling and water-related deterioration was noted on the southwest wingwall, near the abutment and along the top cap edges where scaling deterioration was noted. Scaling deterioration accompanied by hairline cracks and several small edge spalls was noted on all other wingwall elements.

Rating 4

Abutments:

The west abutment exhibited a transverse crack slightly above mid-height, extending the full abutment length. The wall was visibly bowed outward at the crack, suggested lateral dispacement of the stem. Additional vertical hairline cracking was also noted. Concrete deterioration, consisting of spalling, cracking, and efflorescence, totaling approximately 2.79 m^2, was noted in the west abutment wall, at its end and below the longitudinal joint. The east abutment exhibited similar spalling, cracking, and efflorescence at the abutment ends and below the longitudinal joint, although the degree of deterioration was less. Other areas of the abutment were in fair to good condition.

Rating 4

Overall:

The general condition of the wingwalls and abutment suggests that the substructure is in poor condition.

Rating [redacted]

DEFECT AND CONDITION SUMMARY FOR BRIDGE B111A

DECK:

Wearing Surface:	The wearing surface in the eastbound lanes, median, and eastbound shoulder exhibits severe block cracking and alligator cracking, with complete disintegration (raveling) of the top asphalt layer in some areas. The westbound lanes and westbound shoulder have been resurfaced, and some general cracking distress was observed in limited areas.
	Rating 4
Deck Underside:	The underside of the deck was generally in fair condition, with deterioration primarily limited to the longitudinal joint at the bridge centerline. This deterioration consisted of severe freeze/thaw damage, spalling, efflorescence, and exposed, corroded reinforcement. Deterioration extended approximately 610 mm on each side of the joint to a depth of no more than 100 mm. Additional deterioration included several (fewer than 10) small spalls and/or pop-outs.
	Rating 5
Parapets:	The parapets, which are integral with the curbs, exhibit some minor freeze/thaw damage, primarily at the base of the curbs, and limited hairline cracking with efflorescence.
	Rating 5
Joints:	Covered by asphalt. Longitudinal joint when viewed from underside was noted to have experienced extensive concrete deterioration and water leakage. This concrete deterioration is rated as part of the underside deck element.
	Rating N
Drainage:	None.
	Rating N
Overall:	Due to the asphalt overlay, the top of the deck could not be examined. The lack of underside deck cracking suggests that widespread water penetration is not occurring. However, the integral T-beams show cracking with

efflorescence, which suggests otherwise. Overall deck rating is governed by severe asphalt deterioration.

Rating [redacted]

SUPERSTRUCTURE:

Bearings: Not visible.

Rating N

Joints: None.

Rating N

Diaphragms: The end diaphragms exhibited hairline cracking with efflorescence throughout.

Rating [redacted]

Overall: T-beams showed cracking, delamination, efflorescence, and water infiltration both on the web and bottom flange surfaces. This deterioration was more pronounced for edge beams and the first interior beam, as well as beams immediately adjacent to the longitudinal deck joint. Estimated quantities of concrete deterioration included 9.29 m^2 at the bottom flange surface and 13.00 m^2 at the web surface.

Rating [redacted]

SUBSTRUCTURE:

Wingwalls: The wingwalls are generally in fair to good condition. Some spalling and water-related deterioration was noted on the southwest wingwall near the abutment and along the top cap edges. The northeast wingwall has a 40-mm rotation gap at the top of the joint.

Rating 4

Abutments: The east abutment exhibited a transverse crack at its ¾ height for approximately 40 percent of the abutment length. Additional vertical hairline cracking was also noted. A spalled area measuring approximately 0.37 m^2 was noted at the south abutment end. The west abutment exhibited a 5-

mm horizontal crack just above mid-height over 50 percent of the length of the wall. Spalling and water-related deterioration was typical at each abutment end and below the longitudinal joint. A total of 3.25 m^2 of the abutment was spalled or delaminated. Other areas of the abutment were in fair to good condition.

Rating 5

Overall: The generally fair condition of the abutments and the poor to fair condition of the wingwalls indicate that the substructure is in fair condition overall.

Rating 5

DEFECT AND CONDITION SUMMARY FOR BRIDGE B543

DECK:

Wearing Surface: The wearing surface exhibits deterioration ranging from block cracking, to alligator cracking, to alligator cracking with debondment of the top asphalt layer, to the complete loss of the top asphalt layer. The deterioration categorized for each lane is as follows: eastbound shoulder = 90 percent block cracking with 10 percent complete disintegration (raveling) of the top asphalt layer; eastbound lanes = 40 percent block cracking with 60 percent complete disintegration (raveling) of the top asphalt layer; median = 90 percent block cracking with 10 percent alligator cracking; westbound lanes = 100 percent alligator cracking with approximately 50 percent exhibiting debondment and raveling; and westbound shoulder = 50 percent block cracking with 50 pecent exhibiting alligator cracking with debondment and raveling throughout.

Rating 4

Deck Underside: The deck is completely integral with the superstructure and therefore is not visible for inspection. See superstructure rating.

Rating N

Parapets: The parapets, which are integral with the curbs, exhibit moderate to severe deterioration, consisting of freeze/thaw damage, cracking, efflorescence, and delaminations. Approximately 50 to 65 percent of the north parapet has extensive freeze/thaw damage, with spalling and exposed reinforcement typically observed. Approximately 20 percent of the south parapet has extensive freeze/thaw damage, with spalling and exposed reinforcement typically observed. Efflorescence was common at 40 percent of the north parapet cracks, while visible on only 15 percent of the south parapet cracks. Parapets over the wingwall extensions are included in this rating.

Rating 3

Joints: Covered by asphalt. The longitudinal joint when viewed from the underside was noted to have experienced moderate concrete deterioration and water leakage. This concrete deterioration is rated as part of the superstructure element.

Rating N

Drainage: None.

Rating N

Overall: Due to the asphalt overlay, the top of the deck could not be examined. The lack of underside superstructure cracking suggests that widespread water penetration is not occurring. Theoretically, no rating of the deck is possible since it is not visible for inspection. However, asphalt, parapet, and superstructure conditions suggest that a rating of 5 or 6 would be appropriate. A small exploratory opening confirmed this assertion.

Rating 5

SUPERSTRUCTURE:

Bearings: Not visible.

Rating N

Joints: None.

Rating N

Overall: The superstructure is in good condition, with observed deterioration limited to the longitudinal joint and facia surfaces. The underside (rigid frame barrel arch surface) exhibited craze cracking and isolated cracks less than 0.8 mm in width over approximately 10 percent of its area. At the longitudinal joint, concrete deterioration consisting of delamination, spalling, and water infiltration was observed from 75 mm to 610 mm from each side of the joint. At spalled locations, corroded reinforcement was exposed. The facia surfaces exhibited concrete cracking suggestive of freeze/thaw damage over most of their area. Efflorescence was typical at these locations. In general, the facia deterioration was also observed on the superstructure soffit within 100 mm to 150 mm of the facia. Other areas of the superstructure soffit were in good condition, with only small pop-outs or other inconsequential deterioration noted.

Rating 5

SUBSTRUCTURE:

Wingwalls: The wingwalls are generally in good condition. The concrete deterioration is generally limited to surface scaling, minor spalls, and freeze/thaw damage to surface concrete. Damage was primarily limited to the wingwall cap and immediately adjacent to the abutments. Parapet extensions above the wingwalls are included with the deck parapet rating.

Rating 6

Abutments: Both abutment walls exhibited efflorescence and heavy mineral deposits at the centerline longitudinal joint. Concrete deterioration extended within 150 mm to 305 mm on each side of the joint and consisted of delaminations and spalling. Each abutment exhibited full-height cracks in three or four locations.

Rating 6

Overall: Overall, the substructure is in satisfactory condition due to the limited and localized deterioration.

Rating [redacted]

DEFECT AND CONDITION SUMMARY FOR BRIDGE B544

DECK:

Wearing Surface:	The wearing surface was severely deteriorated. The shoulders and median generally exhibited block cracking throughout. The eastbound and westbound passing lanes exhibited alligator cracking. The eastbound drive lane exhibited block cracking, and the westbound drive lane exhibited complete disintegration (raveling) of the top asphalt layer.
	Rating 4
Deck Underside:	The deck soffit was generally in fair to poor condition, except for areas near the longitudinal deck joint and at the slab exterior edges. These areas showed severe freeze/thaw deterioration, cracking, efflorescence, and exposed, corroded reinforcement. Deterioration along the exterior deck edges extended from 150 mm to the full facia depth. The deck soffit cantilevered beyond the exterior girder showed deterioration over 90 percent of its surface. The remaining deck soffit, interior to the exterior girders, was approximately 40 percent delaminated. Almost all bays, as defined by the superstructure framing, showed tight alligator cracking with efflorescence. The underside of the deck joint showed significant water leakage, efflorescence staining, and mineral deposit accumulation.
	Rating 4
Parapet:	The parapets are built integrally with the curbs. Severe freeze/thaw deterioration, with extensive concrete cracking and exposed reinforcement, was observed over 100 percent and 40 percent of the north and south parapet curbs, respectively. The parapet post and railing elements were generally delaminated over approximately 20 percent of their surface area. Cracking, coincident with the parapet post corner bars, was typical throughout.
	Rating 4
Joints:	The joints were covered by asphalt. The longitudinal joint when viewed from the underside was noted to have experienced severe deterioration and water leakage. This deterioration is rated as part of the deck underside.

Rating N

Drainage: None.

Rating N

Overall: Due to the asphalt overlay, the top of the deck could not be examined. The underside deck cracking suggests that widespread water penetration is occurring. Severe deterioration exists, especially near the longitudinal joint and over the cantilever deck surfaces.

Rating [redacted]

SUPERSTRUCTURE:

Bearings: The bearings showed surface corrosion, with some accumulated debris typically around the bearing base plate. The expansion bearing position was contrary to what would be expected for the temperature at the time of the inspection, suggesting possible frozen bearings. The northeast bearing supporting the north exterior girder was mislocated as evidenced by abandoned anchor bolt holes.

Rating 4

Joints: None.

Rating N

Floor Beams: In general, the floor beams were in fair to good condition, with only minor surface corrosion and failed paint noted primarily at flange tips and on the top surfaces of the bottom flange. The web and connection angles at the floor beam end generally showed heavier corrosion and paint failure deterioration. The steel surfaces at these joint locations exhibited water staining and efflorescence build-up to a maximum depth of 75 mm near the base of the connection. Pitting depths on the floor beam web in the immediate vicinity of the end connection was measured at 1.5 mm to 6 mm. Rivet head loss was observed in approximately 60 rivets located near the base of the floor beam end connection. Rivet head cross-sectional loss generally ranged from 20 to 50 percent.

Rating 5

Overall: The exterior surface of the principal girders was in fair condition, with only limited areas of paint failure and corrosion. The top of the flange surface showed a greater occurrence of this deterioration. The south exterior girder bottom flange sustained a vehicular impact resulting in a bent flange and web stiffener, with localized paint failure. The interior surface of the exterior girders and the four interior girders showed corrosion along the top of the bottom flange. Pigeon droppings, dirt, and debris generally covered these surfaces. In general, the paint had also failed; however, section loss was minimal. Splice plates were in good condition, except that water leakage was evidenced by staining at the plate perimeter. Web-pitting section loss, not exceeding 1/16 in. was noted at vertical stiffener and floor beam connection locations. The top flange surfaces showed surface corrosion and localized paint failures throughout the superstructure framing system. The northwest corner of the bridge superstructure was observed to be in contact with the adjacent abutment backwall and wingwall pier. Localized crushing of concrete was observed. This contact was not expected considering the temperature at the time of inspection.

Rating 6

SUBSTRUCTURE:

Wingwalls: The wingwalls were generally in good condition. The concrete deterioration was limited to surface staining, scaling, and minor spalls. The southwest wingwall pier structure has freeze/thaw deterioration over approximately 50 percent of its surface. The three other wingwall piers showed full- or partial-height cracking, with areas (<0.93 m^2) of delamination, water staining, and efflorescence near the top of the pier. Freeze/thaw damage accompanied by small spalls was noted along the wingwall cap of the northeast wingwall and at the far end of the southwest wingwall. The other wingwall caps also showed signs of similar deterioration, but to a lesser extent.

Rating 5

Abutments: The west abutment, at its south end, exhibited cracked concrete with efflorescence and freeze/thaw deterioration.

A total of approximately 2.79 m^2 of surface area is affected at this location. The most severe freeze/thaw damage has occurred over approximately 20 percent of the backwall and abutment seat. A full-height crack was present in the west abutment. The east abutment was cracked, full height, in three locations. Light spalling was noted on the abutment stem just below three of the bearings. The northeast corner of the northernmost bearing pedestal was spalled.

Rating 6

Overall: The generally good condition of the abutments and the fair condition of the wingwalls warrant a rating of satisfactory.

Rating 6

DEFECT AND CONDITION SUMMARY FOR ROUTE 1 BRIDGE

DECK:

Wearing Surface:	The wearing surface consisted of a thin epoxy overlay, and was in good condition. A small quantity (<0.93 m^2) of the epoxy had been worn or had been scraped away by snowplows at the slab edges along the joints.
	Rating 8
Deck Underside:	The deck soffit was generally in good condition. A small number of transverse cracks were observed, with some exhibiting efflorescence. Transverse cracks were generally more prevalent in the deck cantilevers.
	Rating 7
Parapet:	The parapets are built integrally with the deck. The parapets were in good condition, with typical shrinkage cracks observed periodically. Several exhibited light efflorescence. Two small spalls at the shallow reinforcement were observed.
	Rating 7
Railings:	The railings were in very good condition. No deterioration noted.
	Rating 7
Joints:	The joints were replaced in 1998 and are new. The new system consists of a multi-cell neoprene gasket cast into reglets, on each side of the newly constructed joint.
	Rating 9
Drainage:	Drains were functioning properly. The drain pipe discharge location is located at the level of the bottom flange. Consequently, the girder web and flange in this vicinity are subjected to wind-driven moisture.
	Rating 7
Overall:	Due to the epoxy overlay, the top of the deck could not be examined directly. The lack of underside deck cracking

suggests that widespread water penetration is not occurring. Furthermore, the lack of reflective cracking and a chain-drag survey suggest that the top of the deck is sound. Several small delaminations, accounting for less than 1 percent of the deck surface area, were detected.

Rating 7

SUPERSTRUCTURE:

Bearings:

The bearings at expansion joints showed moderate to heavy surface corrosion, with some accumulated debris typically around the bearing base plate for the two exterior bearings at Abutment B. Other bearings at fixed piers were in good condition. Bearing rotation was as expected for the temperature at the time of the inspection and was uniform throughout the four-span system.

Rating 7

Joints:

None. (Note that the structure north of the mid-span expansion joint is not included in this study; therefore, this joint was considered as an end joint and was rated with the deck.)

Rating N

Diaphragms:

In general, the diaphragms were in good condition.

Rating 8

Overall:

The primary and secondary framing was generally in good condition, with satisfactory paint conditions, except in areas adjacent to the expansion joints and near drains. At these locations, the paint was failed and peeling, with light to moderate surface corrosion. Surface corrosion was more pronounced at Abutment B. Limited areas, accounting for less than 5 percent of the total girder surface area, on the bottom flange top surface and web exhibited surface corrosion and deteriorated paint. Paint failure was common on galvanized cable tray members in the east girder bay.

The lateral framing system was noted to have loose fasteners at five locations (three locations are within Span 6). Thirteen crack-like indications (six in Span 6) were noted in the paint at lateral gusset plate weld terminations. This location is historically known to exhibit fatigue-cracking problems. Poor weld profiles and weld blow-through was noted at lateral gusset connections.

Horizontal stiffener butt welds on the exterior girder web have been retrofitted. Several locations (none in Span 6) were not included in the retrofit program because of obstructions that prevented the installation of the recommended repair. Several of the difficult access locations received a modified retrofit (two in Span 6). Crack-like indications in weld terminations were noted at five locations (one in Span 6). Poor field welds exist at five locations (three in Span 6). One butt weld in Span 5 was noted to exhibit a 40-mm-long crack.

Poor workmanship and corrosion were noted at all drainpipe-to-girder support welds. No cracking was observed. Observations were typical in all spans.

Poor workmanship, weld overlapping, and corrosion were noted at all cable tray seat angle-to-girder web connections. No cracking was observed. Observations were typical in all spans.

Insect nests were noted throughout the superstructure framing and often obstructed visual inspection of critical weld toes.

NOTE: Further investigation would be required to discern whether crack-like indications in the paint indicated fatigue cracks in the weld metal or parent material. This work was not done in order to preserve the integrity of the defect for further study by the NDEVC.

Rating 7

SUBSTRUCTURE:

Wingwalls: The wingwalls were generally in good condition.

Rating 8

Abutments: Water staining and debris build-up on horizontal surfaces characterized the condition of Abutment B. Limited, minor cracking was observed.

Rating 8

Piers: The piers were in very good condition. Pier 4, located below an expansion joint, contained approximately 3.72 m^2 of delaminated, cracked concrete. These conditions were typically observed at the top of the pier. Some water staining was also present at Pier 4.

Rating 7

Overall: The abutments and piers were generally in very good condition. Some water staining and limited cracking/delamination were observed.

Rating 8

DEFECT AND CONDITION SUMMARY FOR VAN BUREN ROAD BRIDGE

DECK:

Wearing Surface: No wearing surface is provided.

Rating N

Deck Top Surface: The deck surface is tined to a depth of approximately 1/8 in. Hairline, transverse cracks were noted to extend across nearly the full deck width. Although difficult to identify due to the tined surface, it is believed that 10 to 15 hairline transverse cracks exist. The deck appears to be in good condition; however, a chain drag survey identified delaminations over approximately 15 to 20 percent of the deck surface. The majority of the delaminations occurred in Spans 1 and 2.

Rating 6

Deck Underside: The deck soffit was generally in fair to good condition. A number of transverse cracks were observed, with a limited number exhibiting efflorescence. Transverse cracks were generally more prevalent in the deck cantilevers. Several small spalls (<0.56 m^2) and exposed reinforcement due to inadequate cover were identified.

Rating 7

Parapet: The parapets are built integrally with the deck. The parapets were in good condition, with typical shrinkage cracks observed. Several exhibited light efflorescence. Several small spalls at the shallow reinforcement were observed.

Rating 7

Railings: The railings were in good condition. No deterioration was noted.

Rating 7

Joints: The joint material is generally missing.

Rating 1

Drainage: Drains were functioning properly. Drain run-off has stained concrete surfaces on the deck facia.

Rating [redacted]

Overall: The deck appears to be in good condition. Transverse cracking, although present, does not appear to be supporting through-deck leakage. Delaminations are not visibly identifiable, and therefore are not included in the rating determination. A "5" would be assigned should results of a sounding survey be considered.

Rating 7

SUPERSTRUCTURE:

Bearings: The bearings showed limited surface corrosion, with some accumulated debris typically around the bearing base plate. Bearings were recently painted. Expansion bearings in Span 1 do not appear to be functioning, while expansion bearings in Spans 2 and 3 exhibit scrape marks due to movement of the superstructure. The bearing masonry plate for two bearings in Span 2 is partially unsupported.

Rating [redacted]

Joints: None. The superstructure consists of three simple spans.

Rating N

Diaphragms: In general, the diaphragms were in good condition.

Rating 8

Overall: The primary and secondary framing was generally in good condition, with satisfactory paint condition. The bridge was spot-painted in late 1997. The spot paint was thick and inhibited detection of corrosion pitting, if present. No paint was removed during the inspection.

Crack-like indications at seven (three locations are within Span 2) bottom flange cover plate weld terminations were noted. Several crack-like indications (none in Span 2) were noted in the paint at weld terminations of the vertical diaphragm stiffener-to-girder web connection. In general, this weld toe was of poor quality. These locations are historically known to exhibit fatigue-cracking problems. A small area of the bottom flange in Span 2 was distorted, due to some previous impact.

NOTE: Further investigation would be required to discern whether crack-like indications in the paint indicated fatigue cracks in the weld metal or parent material. This work was not done to preserve the integrity of the defect for further study by the NDEVC.

Rating 7

SUBSTRUCTURE:

Wingwalls: The wingwalls were in good condition.

Rating 8

Abutments: Water staining and debris build-up on horizontal surfaces characterized the condition of the abutments. Limited, minor cracking was observed.

Rating 8

Piers: The piers were in good condition. All piers exhibit water staining due to the failed joints above. Pier 1, located in the stream bed, has experienced erosion of surface paste. A small area near the top of Pier 1 shows poor consolidation and moderate freeze/thaw damage. Several small spalls and exposed reinforcement were noted on the piers, but each was less than 0.093 m^2 in area.

Rating 7

Slope Protection: The slope protection at the north abutment has settled approximately 50 mm at the abutment. The lower 50 percent of the slope protection has experienced greater settlement and failure due to water action.

Rating 5

Overall: The abutments and piers were generally in very good condition. Some water staining, surface erosion, and limited cracking/delamination were observed.

Rating 8

APPENDIX E. TASK PROTOCOLS

TASK A PROTOCOL

1. Read the following:

   "This structure, constructed in 1940, is Bridge B521 over the decommissioned section of the Pennsylvania Turnpike. What you will be asked to do during this task is to perform a Routine Inspection of the superstructure, the substructure, and the deck (excluding the wearing surface). To refresh your memory, Routine Inspections are regularly scheduled inspections completed to determine the physical and functional condition of a bridge. Routine Inspections also serve to ensure that a bridge continues to satisfy all applicable serviceability requirements. Routine Inspections are commonly referred to as normal NBIS inspections. I want to take this time to remind you that all of your inspection findings and my observations will be confidential. Do you have any general questions about this inspection?

   Please keep the safety provisions we discussed yesterday in mind while you complete this inspection. Do you have any questions about any of these safety issues?

   My role while you complete this inspection will be to simply observe and jot down some simple notes about what you are doing. I will not be assisting you as you complete this inspection. I want to also assure you that I am not scoring or grading you. I am simply taking notes about how and what you are doing. If you have any questions while you are completing the task, please feel free to ask me. If I am allowed to answer the question, I will be happy to do so. Do you have any questions about what my role will be?

   These are the forms you are to use while completing the inspection. Note that there is room for you to make notes . If you do make some notes, I ask that you keep them as brief as possible. Please note that these are generic forms used for a wide variety of bridges. You should use only those items appropriate to your inspection of this bridge. Please note the prepared bridge plans included in the forms. I ask that when you find something that you would normally note, please indicate its location on the plans and record any measurements you made. I want to let you know that you should not feel obligated to spend a great deal of time at any one location. Please just simply note your findings and move on. Do you have any questions about these forms?"

2. Give Task A pre-task questionnaire.

3. Read the following:

   "We will now begin this inspection task. You have 40 minutes to complete the Routine Inspection of the deck, excluding the wearing surface, superstructure, and substructure of this bridge. This time limit has been developed from inspectors around the country. Although I must ask that you attempt to complete this task within the time allotted, you should also keep in mind the fact that this is not a race. Please perform this inspection as you would typically perform a Routine Inspection. However, please keep in mind that you must not damage the bridge in any way so that we can preserve its current state for other inspectors. In this light, I would ask that if you would normally have done some sort of invasive procedure had we not prohibited it, please make a brief note indicating the procedure and location. For the purposes of this inspection, you do not need to make gross dimension checks or inspect non-structural elements like the approach rail. Do you have any questions? Let's begin."

4. Start the clock in the Palm Pilot (set for 40 minutes).

5. Complete the during-task observation form.

6. If time runs out, ask the Inspector to stop, and make a note of where the inspector stopped.

7. Give the Task A post-task questionnaire.

8. Read the following:

   "Thank you for completing this inspection task. Your findings and your inspection procedures will be useful in assessing how bridge inspections are typically completed. Do you have any questions about the task you just completed?"

TASK B PROTOCOL

1. Read the following:

   "This structure, constructed in 1939, is Bridge B101A over an unmarked gravel access road. What you will be asked to do during this task is to perform a Routine Inspection of the deck, superstructure, and substructure of this bridge. To refresh your memory, Routine Inspections are regularly scheduled inspections completed to determine the physical and functional condition of a bridge. Routine Inspections also serve to ensure that a bridge continues to satisfy all applicable serviceability requirements. Routine Inspections are commonly referred to as normal NBIS inspections. I want to take this time to remind you that all of your inspection findings and my observations will be confidential. Do you have any general questions about this inspection?

   Please keep the safety provisions we discussed yesterday in mind while you complete this inspection. Do you have any questions about any of these safety issues?

   My role while you complete this inspection will be to simply observe and jot down some simple notes about what you are doing. I will not be assisting you as you complete this inspection. I want to also assure you that I am not scoring or grading you. I am simply taking notes about how and what you are doing. If you have any questions while you are completing the task, please feel free to ask me. If I am allowed to answer the question, I will be happy to do so. Do you have any questions about what my role will be?

   These are the forms you are to use while completing the inspection. Note that there is room for you to make notes if you wish. If you do make some notes, I ask that you keep them as brief as possible. Please note that these are generic forms used for a wide variety of bridges. You should use only those items appropriate to your inspection of this bridge. Please note the prepared bridge plans included in the forms. I ask that when you find something that you would normally note, please indicate its location on these plans and record any measurements you made. I want to let you know that you should not feel obligated to spend a great deal of time at any one location. Please just simply note your findings and move on. Do you have any questions about these forms?"

2 Give Task B pre-task questionnaire.

3. Read the following:

   "We will now begin this inspection task. You have 50 minutes to complete the Routine Inspection of the deck, superstructure, and substructure of this bridge. This time limit has been developed from inspectors around the country. Although I must ask that you attempt to complete this task within the time allotted, you should also keep in mind the fact that this is not a race. Please perform this inspection as you would typically perform a Routine Inspection. However, please keep in mind that you must not damage the bridge in any way so that we can preserve its current state for other inspectors. In this light, I would also ask that if you would normally have done some sort of invasive procedure had we not prohibited it, please make a brief note indicating the procedure and location. For the purposes of this inspection, you do not need to make gross dimension checks or inspect non-structural elements like the approach rail. Do you have any questions? Let's begin."

4. Start the clock in the Palm Pilot (set for 50 minutes).

5. Complete the during-task observation form.

6. If time runs out, ask the Inspector to stop, and make a note of where the inspector stopped.

7. Give the Task B post-task questionnaire.

8. Read the following:

   "Thank you for completing this inspection task. Your findings and your inspection procedures will be useful in assessing how bridge inspections are typically completed. Do you have any questions about the task you just completed?"

TASK C PROTOCOL

1. Read the following:

   "This structure, constructed in 1939, is Bridge B111A over State Route 1011. What you will be asked to do during this task is to perform a Routine Inspection of the deck, superstructure, and substructure of this bridge. To refresh your memory, Routine Inspections are regularly scheduled inspections completed to determine the physical and functional condition of a bridge. Routine Inspections also serve to ensure that a bridge continues to satisfy all applicable serviceability requirements. Routine Inspections are commonly referred to as normal NBIS inspections. I want to take this time to remind you that all of your inspection findings and my observations will be confidential. Do you have any general questions about this inspection?

   Please keep the safety provisions we discussed yesterday in mind while you complete this inspection. Do you have any questions about any of these safety issues?

   My role while you complete this inspection will be to simply observe and jot down some simple notes about what you are doing. I will not be assisting you as you complete this inspection. I want to also assure you that I am not scoring or grading you. I am simply taking notes about how and what you are doing. If you have any questions while you are completing the task, please feel free to ask me. If I am allowed to answer the question, I will be happy to do so. Do you have any questions about what my role will be?

   These are the forms you are allowed to use while completing the inspection. Note that there is room for you to make notes. If you do make some notes, I ask that you keep them as brief as possible. Please note that these are generic forms used for a wide variety of bridges. You should use only those items appropriate to your inspection of this bridge. Please note the prepared bridge plans included in the forms. I ask that when you find something that you would normally note, please indicate its location on these plans and record any measurements you made. I want to let you know that you should not feel obligated to spend a great deal of time at any one location. Please just simply note your findings and move on. Do you have any questions about these forms?"

2. Give Task C pre-task questionnaire.

3. Read the following:

   "We will now begin this inspection task. You have 30 minutes to complete the Routine Inspection of the deck, superstructure, and substructure of this bridge. This time limit has been developed from inspectors around the country. Although I must ask that you attempt to complete this task within the time allotted, you should also keep in mind the fact that this is not a race. Please perform this inspection as you would typically perform a Routine Inspection. However, please keep in mind that you must not damage the bridge in any way so that we can preserve its current state for other inspectors. In light of this, I would ask that if you would normally have done some sort of invasive procedure had we not prohibited it, please make a brief note indicating the procedure and location. For the purposes of this inspection, you do not need to make gross dimension checks or inspect non-structural elements like the approach rail. Do you have any questions? Let's begin."

4. Start the clock in the Palm Pilot (set for 30 minutes).

5. Complete the during-task observation form.

6. If time runs out, ask the Inspector to stop, and make a note of where the inspector stopped.

7. Give the Task C post-task questionnaire.

8. Read the following:

   "Thank you for completing this inspection task. Your findings and your inspection procedures will be useful in assessing how bridge inspections are typically completed. Do you have any questions about the task you just completed?"

TASK D PROTOCOL

1. Read the following:

   "This structure, constructed in 1939, is Bridge B543 over a decommissioned Turnpike ramp. What you will be asked to do during this task is to perform a Routine Inspection of the deck, superstructure, and the substructure of this bridge. To refresh your memory, Routine Inspections are regularly scheduled inspections completed to determine the physical and functional condition of a bridge. Routine Inspections also serve to ensure that a bridge continues to satisfy all applicable serviceability requirements. Routine Inspections are commonly referred to as normal NBIS inspections. I want to take this time to assure you that all of your inspection findings and my observations are strictly confidential. Do you have any general questions about this inspection?

   Please keep the safety provisions we discussed yesterday in mind while you complete this inspection. Do you have any questions about any of these safety issues?

   My role while you complete this inspection will be to simply observe and jot down some simple notes about what you are doing. I will not be assisting you as you complete this inspection. I want to also assure you that I am not scoring or grading you. I am simply taking notes about how and what you are doing. If you have any questions while you are completing the task, please feel free to ask me. If I am allowed to answer the question, I will be happy to do so. Do you have any questions about what my role will be?

   These are the forms you are to use while completing the inspection. Note that there is room for you to make notes. If you do make some notes, I ask that you keep them as brief as possible. Please note that these are generic forms used for a wide variety of bridges. You should use only those items appropriate to your inspection of this bridge. Please note the prepared bridge plans included in the forms. I ask that when you find something that you would normally note, please indicate its location on these plans and record any measurements you made. Additionally, please use this digital camera to record your findings. If you have any questions about the use of this camera, please feel free to ask me at any time. I want to let you know that you should not feel obligated to spend a great deal of time at any one location. Please just simply note your findings and move on. Do you have any questions about these forms?"

2. Give Task D pre-task questionnaire.

3. Read the following:

   "We will now begin this inspection task. You have 40 minutes to complete the Routine Inspection of the deck, superstructure, and substructure of this bridge. This time limit has been developed from inspectors around the country. Although I must ask that you attempt to complete this task within the time allotted, you should also keep in mind the fact that this is not a race. Please perform this inspection as you would typically perform a Routine Inspection. However, please keep in mind that you must not damage the bridge in any way so that we can preserve its current state for other inspectors. In this light, I would also ask that if you would normally have done some sort of invasive procedure had we not prohibited it, please make a brief note indicating the procedure and location. For the purposes of this inspection, you do not need to make gross dimension checks or inspect non-structural elements like the approach rail. Do you have any questions? Let's begin."

4. Start the clock in the Palm Pilot (set for 40 minutes).

5. Complete the during-task observation form.

6. If time runs out, ask the Inspector to stop, and make a note of where the inspector stopped.

7. Give the Task D post-task questionnaire.

8. Read the following:

   "Thank you for completing this inspection task. Your findings and your inspection procedures will be useful in assessing how bridge inspections are typically completed. Do you have any questions about the task you just completed?"

TASK E PROTOCOL

1. Read the following:

   "This structure, constructed in 1939, is Bridge B544 over U.S. Route 30. What you will be asked to do during this task is to perform a Routine Inspection of the deck, superstructure, and substructure of this bridge. To refresh your memory, Routine Inspections are regularly scheduled inspections completed to determine the physical and functional condition of a bridge. Routine Inspections also serve to ensure that a bridge continues to satisfy all applicable serviceability requirements. Routine Inspections are commonly referred to as normal NBIS inspections. I want to take this time to remind you that all of your inspection findings and my observations will be confidential. Do you have any general questions about this inspection?

   Please keep the safety provisions we discussed yesterday in mind while you complete this inspection. Do you have any questions about any of these safety issues?

   My role while you complete this inspection will be to simply observe and jot down some simple notes about what you are doing. I will not be assisting you as you complete this inspection. I want to also assure you that I am not scoring or grading you. I am simply taking notes about how and what you are doing. If you have any questions while you are completing the task, please feel free to ask me. If I am allowed to answer the question, I will be happy to do so. Do you have any questions about what my role will be?

   These are the forms you are to use while completing the inspection. Note that there is room for you to make notes. If you do make some notes, I ask that you keep them as brief as possible. Please note that these are generic forms used for a wide variety of bridges. You should use only those items appropriate to your inspection of this bridge. Please note the prepared bridge plans included in the forms. I ask that when you find something that you would normally note, please indicate its location on the plans and record any measurements you made. I want to let you know that you should not feel obligated to spend a great deal of time at any one location. Please just simply note your findings and move on. Do you have any questions about these forms?"

2. Give Task E pre-task questionnaire exactly as it is given in the Palm Pilot.

3. Read the following:

   "We will now begin this inspection task. You have 1 hour to complete the Routine Inspection of the deck, superstructure, and substructure of this bridge. This time limit has been developed from inspectors around the country. Although I must ask that you attempt to complete this task within the time allotted, you should also keep in mind the fact that this is not a race. Please perform this inspection as you would typically perform a Routine Inspection. However, please keep in mind that you must not damage the bridge in any way so that we can preserve its current state for other inspectors. In this light, I would ask that if you would normally have done some sort of invasive procedure had we not prohibited it, please make a brief note indicating the procedure and location. For the purposes of this inspection, you do not need to make gross dimension checks or inspect non-structural elements like the approach rail. Do you have any questions? Let's begin."

4. Start the clock in the Palm Pilot (set for 1 hour).

5. Complete the during-task observation form.

6. If time runs out, ask the Inspector to stop, and make a note of where the inspector stopped.

7. Give the Task E post-task questionnaire.

8. Read the following:

   "Thank you for completing this inspection task. Your findings and your inspection procedures will be useful in assessing how bridge inspections are typically completed. Do you have any questions about the task you just completed?"

TASK F PROTOCOL

1. Read the following:

   "This structure, constructed in 1939, is Bridge B544 over U.S. Route 30. What you will be asked to do during this task is to perform an In-Depth Inspection of approximately one-third of the below-deck superstructure of this bridge. To refresh your memory, In-Depth Inspections are close-up, hands-on inspections of one or more members in order to identify deficiencies not normally detectable during Routine Inspections. I want to take this time to remind you that all of your inspection findings and my observations will be confidential. Do you have any general questions about this inspection?

   Please keep the safety provisions we discussed yesterday in mind while you complete this inspection. The most important safety item concerns the use of this 12.19-m boom lift. OSHA requirements mandate that we both wear safety harnesses and tie-off lanyards whenever the boom is in operation. If needed, we will maintain 100 percent tie-off by using additional lanyards. Do you have any questions about the use of fall protection or any other safety issues?

   My role while you complete this inspection will be twofold. First, to simply observe and jot down some simple notes about what you are doing. I will not be assisting you as you complete this inspection. I want to also assure you that I am not scoring or grading you. I am simply taking notes about how and what you are doing. If you have any questions while you are completing the task, please feel free to ask me. If I am allowed to answer the question, I will be happy to do so. My second main role will be to operate all controls while we are using the boom lift. Do you have any questions about what my role will be?

   These are the forms you are to use while completing the inspection. Note that there is room for you to make notes. If you do make some notes, I ask that you keep them as brief as possible. Please note the prepared bridge plans included in these forms. I ask that when you find something that you would normally note, please indicate its location on the plans and record any measurements you made. I want to let you know that you should not feel obligated to spend a great deal of time at any one location. Please just simply note your findings and move on. Do you have any questions about these forms or how you are to record your findings?"

2. Give Task F pre-task questionnaire.

3. Read the following:

   "We will now begin this inspection task. You have 3 hours to complete the In-Depth Inspection of the superstructure of the SW quarter of the bridge to the indicator marks using the boom lift and the NE section of the bridge using the 9.75-m ladder out to the first set of sway frames. The time limit has been developed from inspectors around the country. Although I must ask that you attempt to complete this task within the time allotted, you should also keep in mind the fact that this is not a race. Please perform this inspection as you would typically perform an In-Depth Inspection. However, please keep in mind that you must not damage the bridge in any way so that we can preserve its current state for other inspectors. In this light, I would ask that if you would normally have done some sort of invasive procedure had we not prohibited it, please make a brief note indicating the procedure and location. For the purposes of this inspection, you do not need to make gross dimension checks. Do you have any questions? Let's begin."

4. Start the clock in the Palm Pilot (set for 3 hours).

5. Complete the during-task observation form.

6. If time runs out, ask the Inspector to stop, and make a note of where the inspector stopped.

7. Give the Task F post-task questionnaire.

8. Read the following:

   "Thank you for completing this inspection task. Your findings and your inspection procedures will be useful in assessing how bridge inspections are typically completed. Do you have any questions about the task you just completed?"

TASK G PROTOCOL

1. Read the following:

   "This structure, constructed in 1975, is the Route 1 bridge over the Occoquan River. What you will be asked to do during this task is to perform a Routine Inspection of a portion of the deck, superstructure, and substructure of the southern half of this bridge. To refresh your memory, Routine Inspections are regularly scheduled inspections completed to determine the physical and functional condition of a bridge. Routine Inspections also serve to ensure that a bridge continues to satisfy all applicable serviceability requirements. Routine Inspections are commonly referred to as normal NBIS inspections. I want to take this time to remind you that all of your inspection findings and my observations will be confidential. Do you have any general questions about this task?

   Please keep the safety provisions we discussed 2 days ago in mind while you complete this inspection. Do you have any questions about any of these safety issues?

   My role while you complete this inspection will be to simply observe and jot down some simple notes about what you are doing. I will not be assisting you as you complete this inspection. I want to also assure you that I am not scoring or grading you. I am simply taking notes about how and what you are doing. If you have any questions while you are completing the task, please feel free to ask me. If I am allowed to answer the question, I will be happy to do so. Do you have any questions about what my role will be?

   These are the forms you are to use while completing the inspection. Note that there is room for you to make notes. If you do make some notes, I ask that you keep them as brief as possible. Please note that these are generic forms used for a wide variety of bridges. You should use only those items appropriate to your inspection of this bridge. Please note the prepared bridge plans included in the forms. I ask that when you find something that you would normally note, please indicate its location on these plans and record any measurements you made. I want to let you know that you should not feel obligated to spend a great deal of time at any one location. Please just simply note your findings and move on. Do you have any questions about these forms?"

2. Give Task G pre-task questionnaire.

3. Read the following:

   "We will now begin this inspection task. You have 2 hours to complete the Routine Inspection of a portion of the deck, superstructure, and substructure of the southern four spans of this bridge. This time limit has been developed from inspectors around the country. Although I must ask that you attempt to complete this task within the time allotted, you should also keep in mind the fact that this is not a race. Please perform this inspection as you would typically perform a Routine Inspection. However, please keep in mind that you must not damage the bridge in any way so that we can preserve its current state for other inspectors. In this light, I would ask that if you would normally have done some sort of invasive procedure had we not prohibited it, please make a brief note indicating the procedure and location. For the purposes of this inspection, you do not need to make gross dimension checks or determine underwater stream profiles. When inspecting the top side of the deck, you must remain behind the guardrail at all times. Do you have any questions? Let's begin."

4. Start the clock in the Palm Pilot (set for 2 hours).

5. Complete the during-task observation form.

6. If time runs out, ask the Inspector to stop, and make a note of where the inspector stopped.

7. Give the Task G post-task questionnaire.

8. Read the following:

   "Thank you for completing this inspection task. Your findings and your inspection procedures will be useful in assessing how bridge inspections are typically completed. Do you have any questions about the task you just completed?"

TASK H PROTOCOL

1. Read the following:

   "This structure, constructed in 1975, is the Route 1 bridge over the Occoquan River. What you will be asked to do during this task is to perform an In-Depth Inspection of one bay of one span of this bridge, excluding the bearings. As I mentioned, you will be asked to perform an In-Depth Inspection. To refresh your memory, In-Depth Inspections are close-up, hands-on inspections of one or more members in order to identify deficiencies not normally detectable during Routine Inspections. I want to take this time to remind you that all of your inspection findings and my observations will be confidential. Do you have any general questions about this inspection?

   Please keep the safety provisions we discussed 2 days ago in mind while you complete this inspection. The most important safety item you need to recall concerns the use of this 18.28-m boom lift. OSHA requirements mandate that we both wear safety harnesses and tie-off lanyards whenever the boom is in operation. If needed, we will maintain 100 percent tie-off by using additional lanyards. Do you have any questions about the use of the boom lift or any other safety issues?

   My role while you complete this inspection will be twofold. First, to simply observe and jot down some simple notes about what you are doing. I will not be assisting you as you complete this inspection. I want to also assure you that I am not scoring or grading you. I am simply taking notes about how and what you are doing. If you have any questions while you are completing the task, please feel free to ask me. If I am allowed to answer the question, I will be happy to do so. My second main role will be to operate all controls while we are using the lift. Do you have any questions about what my role will be?

   These are the forms you are to use while completing the inspection. Note that there is room for you to make notes. If you do make some notes, I ask that you keep them as brief as possible. Please note the prepared bridge plans included in the forms. I ask that when you find something that you would normally note, please indicate its location on these plans and record any measurements you made. I want to let you know that you should not feel obligated to spend a great deal of time at any one location. Please just simply note your findings and move on. Do you have any questions about these forms or how you are to record your findings?"

2. Give Task H pre-task questionnaire.

3. Read the following:

   "We will now begin this inspection task. You have 2 hours to complete the In-Depth Inspection of the easternmost bay of this span, excluding the bearings. This time limit has been developed from inspectors around the country. Although I must ask that you attempt to complete this task within the time allotted, you should also keep in mind the fact that this is not a race. Please perform this inspection as you would typically perform an In-Depth

Inspection. However, please keep in mind that you must not damage the bridge in any way so that we can preserve its current state for other inspectors. In this light, I would ask that if you would normally have done some sort of invasive procedure had we not prohibited it, please make a brief note indicating the procedure and location. Do you have any questions? Let's begin."

4. Start the clock in the Palm Pilot (set for 2 hours).

5. Complete the during-task observation form.

6. If time runs out, ask the Inspector to stop, and make a note of where the inspector stopped.

7. Give the Task H post-task questionnaire.

8. Read the following"

   "Thank you for completing this inspection task. Your findings and your inspection procedures will be useful in assessing how bridge inspections are typically completed. Do you have any questions about the task you just completed?"

TASK I PROTOCOL

1. Read the following:

   "This structure, constructed around 1960, is the Van Buren Road Bridge over the Quantico Creek. What you will be asked to do during this task is to perform a Routine Inspection of the southern two spans of this bridge. You should recall that we sent you a packet of information about this bridge with instructions to prepare to do this inspection as you normally would. This was to include all required data sheets and a "plan of attack" for completing a Routine Inspection of this structure. To refresh your memory, Routine Inspections are regularly scheduled inspections completed to determine the physical and functional condition of a bridge. Routine Inspections also serve to ensure that a bridge continues to satisfy all applicable serviceability requirements. Routine Inspections are commonly referred to as normal NBIS inspections. I want to take this time to remind you that all of your inspection findings and my observations will be confidential. Do you have any general questions about this inspection?

   Please keep the safety provisions we discussed yesterday in mind while you complete this inspection. Do you have any questions about any of these safety issues?

   My role while you complete this inspection will be to simply observe and jot down some simple notes about what you are doing. I will not be assisting you as you complete this inspection. I want to also assure you that I am not scoring or grading you. I am simply taking notes about how and what you are doing. If you have any questions while you are completing the task, please feel free to ask me. If I am allowed to answer the question, I will be happy to do so. Do you have any questions about what my role will be?

   You are to only use the forms that you prepared in advance.

   Do you have any questions about what I am expecting?"

2. Give Task I pre-task questionnaire.

3. Read the following:

   "We will now begin this inspection task. You have 2 hours to complete the Routine Inspection of the deck, superstructure, and substructure of the southern two spans of this bridge. This time limit has been developed from inspectors around the country. Although I must ask that you attempt to complete this task within the time allotted, you should also keep in mind the fact that this is not a race. Please perform this inspection as you would typically perform a Routine Inspection. However, please keep in mind that you must not damage the bridge in any way so that we can preserve its current state for other inspectors. For the purposes of this inspection, you do not need to determine underwater stream profiles or inspect non-structural elements like the approach rail. Do you have any questions? Let's begin."

4. Start the clock in the Palm Pilot (set for 2 hours).

5. Complete the during-task observation form.

6. If time runs out, ask the Inspector to stop, and make a note of where the inspector stopped.

7. Give the Task I post-task questionnaire.

8. Read the following:

   "Thank you for completing this inspection task. Your findings and your inspection procedures will be useful in assessing how bridge inspections are typically completed. Do you have any questions about the task you just completed?"

APPENDIX F. SELF-REPORT QUESTIONNAIRES

SELF-REPORT QUESTIONNAIRE

Inspector ID: ____________

Please note that all questions are voluntary. Additionally, note that, all answers are strictly confidential.

1. Age: ____________
   Height: ____________
   Weight: ____________

2. How would you describe your general physical condition?

Poor	Below Average	Average	Above Average	Superior
1	2	3	4	5

3. Do you currently have any orthopedic ailments (e.g. bad knees, bad back)?
   Yes **No**

   If so, list: ________________________________

4. Are you currently experiencing any temporary physical ailments (e.g. flu, head cold, etc.)?
   Yes **No**

   If so, list: ________________________________

5. How would you describe your general mental condition?

Poor	Below Average	Average	Above Average	Superior
1	2	3	4	5

6. Are you currently experiencing additional stress due to personal problems (e.g. death in family, etc.)?
   Yes **No**

7. Overall today, how do you feel?

Poor	Below Average	Average	Above Average	Superior
1	2	3	4	5

8. During an average bridge inspection, do you ever feel so tired or winded that you have to work slower or temporarily stop working?

Never	Very Rarely	Sometimes	Often	Almost Always
1	2	3	4	5

   If so, under what conditions and how often: ____________________________
   ____

9. Do you feel your work as a bridge inspector is important to public safety?

Not at all	Slightly Important	Important	Very Important	Essential
1	2	3	4	5

10. Do you ever assess the importance to public safety of the inspection that you are performing?

Yes **No**

11. In general, how would you describe your level of mental focus over an entire bridge inspection?

Poor	Slightly Unfocused	Average	Somewhat Focused	Very Focused
1	2	3	4	5

12. How interesting is your work as a bridge inspector?

Very Boring	Boring	Average	Somewhat Interesting	Very Interesting
1	2	3	4	5

13. Imagine the following situation:

You are inspecting the superstructure of a steel girder/concrete deck bridge. The bridge is 60 ft high and the only means of access to the girders is from a snooper truck and the wind is gusting to 20 mph.

How fearful of the working height do you feel you would be?

Very Fearful	Somewhat Fearful	Mostly Fearless	No Fear
1	2	3	4

14. Imagine the following situation:

You are inspecting the interior of a 150-ft-long prestressed concrete box girder. The only light source is your flashlight. Traffic on the bridge continues uninterrupted and you can feel every passing vehicle.

How fearful of working in this enclosed space would you be?

Very Fearful	Somewhat Fearful	Mostly Fearless	No Fear
1	2	3	4

15. Imagine the following situations:

You are completing an In-Depth Inspection of a major two-lane divided highway bridge. Only one lane can be closed at a time. Most of your time is spent kneeling at deck level to inspect the deck.

How fearful of the vehicular traffic do you feel you would be?

Very Fearful	Somewhat Fearful	Mostly Fearless	No Fear
1	2	3	4

16. Have you ever been involved in an accident where you as a pedestrian were struck by a moving vehicle?
   Yes **No**

17. Have you ever been involved in an accident where you fell from typical bridge inspection working heights?
   Yes **No**

18. What is the highest educational level that you have completed?

_____	Some High School			
_____	High School Degree or equivalent			
_____	Some Trade School			
_____	Trade School Degree			
_____	Some College			
_____	Associate's Degree	*Choose one*	*CE Technology*	*Other*
_____	Bachelor's Degree	*Choose one*	*Civil Engineering*	*Other*
_____	Some Graduate Work	*Choose one*	*Civil Engineering*	*Other*
_____	Master's Degree	*Choose one*	*Civil Engineering*	*Other*
_____	Terminal Degree (e.g., Ph.D.)	*Choose one*	*Civil Engineering*	*Other*
_____	Other: ________________			

19. What specific type of training have you had in bridge inspection? *(you may check more than one)*

State Training

_____ In-house state-run bridge inspection training program.
_____ Apprentice training on the job by experienced inspectors.
_____ Other: ________________

FHWA Training

_____ Bridge Inspector's Training Course Part I – Engineering Concepts for Bridge Inspectors (NHI #13054)
_____ Bridge Inspector's Training Course Part II – Safety Inspection of In-Service Bridges (NHI #13055)
_____ Inspection of Fracture Critical Bridge Members Training Course
_____ Bridge Inspector's Training Course Refresher Training
_____ Nondestructive Testing Methods for Steel Bridges
_____ Culvert Design (NHI #13056)
_____ Other: ________________

Other: ____
____
____

20. How many years of experience do you have in bridge inspection? ____________

21. How many years of experience do you have in highway structures? ______________

22. Have you ever worked as an inspector in another industry (e.g., aircraft, nuclear power, etc.)?
    Yes **No**

23. How many more years do you expect to be performing bridge inspection before you move to another job or retire? __________

24. Is your organization's bridge inspection philosophy more similar to a) or b)?
    _____ a) Provide an adequate inspection with the goal being to comply with NBIS.
    _____ b) Provide a thorough inspection with the goal being to find all defects.

25. How do you mentally prepare to complete a typical bridge inspection? *(you may check more than one)*
    _____ Study previous inspection reports for the particular bridge.
    _____ Study cases of similar bridges for help in determining probable places to look for defects.
    _____ Mentally recall similar bridges you have inspected.
    _____ No preparation.

26. In general, do your supervisors: (check only **one**)
    _____ a) Provide you with a detailed checklist of items to inspect while at the bridge site?
    _____ b) Provide loose guidelines for the inspection but leave the exact process up to you?
    _____ c) Allow you to inspect the bridge using solely your own techniques, skills, and knowledge of the bridge inspection process?

27. How would you describe your relationship with your direct superior?

Very Poor	Poor	Average	Good	Very Good
1	2	3	4	5

28. Do you feel that management feels that the work you do is important?

Not at all	Slightly Important	Important	Very Important	Essential
1	2	3	4	5

29. Within your duties for the State DOT, do you perform any work other than bridge inspection (i.e. construction inspection, etc.)? If so, what percentage of your time is spent at each activity?

Activity: Bridge Inspection % of time: _________
Activity: ________________________________ % of time: _________
Activity: ________________________________ % of time: _________
Activity: ________________________________ % of time: _________

30. Given the following two definitions:

- Routine Inspection—Routine Inspections are regularly scheduled inspections completed to determine the physical and functional condition of a bridge and to identify changes from the last inspection. Further, Routine Inspections serve to ensure that a bridge continues to satisfy all applicable serviceability requirements. Routine Inspections are also commonly known as NBI inspections.
- In-Depth Inspection—In-Depth Inspections are close-up, hands-on inspections of one or more bridge members in order to identify deficiencies not normally detectable during Routine Inspections.

What percentage of your inspection duties could be classified as Routine Inspections?

____

What percentage of your inspection duties could be classified as In-Depth Inspections?

____

31. For the following hypothetical bridge, how many people would make-up a field inspection team (excluding traffic control personnel), and how much time (in man-hours) would be budgeted?

Twenty-year-old, two-span bridge carrying two-lane road (medium ADT) over a small creek, maximum height above the creek is 20 ft.

Superstructure: Steel, four-girder superstructure (rolled shapes); welded flange cover plates; concrete deck.

Substructure: Concrete abutments, a single three-column concrete pier (with pier cap) out of the normal watercourse.

People: __________
Man-hours: __________

32. Estimate the percentage of bridge inspections completed with a registered Professional Engineer (PE) on-site? *(circle one)*

0-20 20-40 40-60 60-80 80-100

33. Do you currently take any of the following substances?

Bilberry
Viagra
B vitamin complex

Yes **No**

34. In comparison to other bridge inspectors, how would you classify yourself based on your past performance?

Poor	Below average	Average	Above average	Excellent
1	2	3	4	5

35. If it was under your control, how do you think that bridge inspections could be improved?

____
____
____

36. Have you ever seen a bridge failure in person?

Yes **No**

If yes, please describe:

____
____
____

37. What time zone do you normally work in?

____

38. Approximately how many bridges do you inspect each year?

____

39. Briefly describe how you became a bridge inspector?

____
____
____

40. Within your organization how important do you feel bridge inspection is?

Not Important	Slightly Important	Average	Somewhat Important	Very Important
1	2	3	4	5

EXIT SELF-REPORT QUESTIONNAIRE

Inspector ID: ___________

Please note that all questions are voluntary. Additionally, note that, all answers are strictly confidential.

1. Age: ___________
   Height: ___________
   Weight: ___________

2. How would you describe your general physical condition?

Poor	Below Average	Average	Above Average	Excellent
1	2	3	4	5

3. Do you currently have any orthopedic ailments (e.g. bad knees, bad back)?
   Yes **No**

   If so, list: ______________________________

4. Are you currently experiencing any temporary physical ailments (e.g. flu, head cold, etc.)?
   Yes **No**

   If so, list: ______________________________

5. How would you describe your general mental condition?

Poor	Below Average	Average	Above Average	Excellent
1	2	3	4	5

6. Overall, how do you feel today?

Poor	Below Average	Average	Above Average	Excellent
1	2	3	4	5

7. During an average bridge inspection, do you ever feel so tired or winded that you have to work slower or temporarily stop working?

Never	Very Rarely	Sometimes	Often	Almost Always
1	2	3	4	5

   If so, under what conditions and how often: ______________________________
   ____

8. Do you feel your work as a bridge inspector is important to public safety?

Not at all	Slightly Important	Important	Very Important	Essential
1	2	3	4	5

9. In general, how would you describe your level of mental focus over an entire bridge inspection?

Poor	Slightly Unfocused	Average	Somewhat Focused	Very Focused
1	2	3	4	5

10. How interesting is your work as a bridge inspector?

Very Boring	Boring	Average	Somewhat Interesting	Very Interesting
1	2	3	4	5

11. How many more years do you expect to be performing bridge inspection before you move to another job or retire? __________

12. Is your organization's bridge inspection philosophy more similar to a) or b)?

_____ a) Provide an adequate inspection with the goal being to comply with NBIS.
_____ b) Provide a thorough inspection with the goal being to find all defects.

13. How would you describe your relationship with your direct superior?

Very Poor	Poor	Average	Good	Very Good
1	2	3	4	5

14. Do you feel that management feels that the work you do is important?

Not at all	Slightly Important	Important	Very Important	Essential
1	2	3	4	5

15. Do you currently take any of the following substances?

Bilberry
Viagra
B vitamin complex

Yes **No**

16. In comparison to other bridge inspectors, how would you classify yourself based on your past performance?

Poor	Below average	Average	Above average	Excellent
1	2	3	4	5

17. If it was under your control, how do you think that bridge inspections could be improved?

____
____
____

18. Have you ever seen a bridge failure in person?
Yes **No**

If yes, please describe:

____
____
____

19. Approximately how many bridges do you inspect each year?

____

20. Briefly describe how you became a bridge inspector.

____
____
____

21. Within your organization, how important do you feel bridge inspection is?

Not Important	Slightly Important	Average	Somewhat Important	Very Important
1	2	3	4	5

22. Did you enjoy participating in these inspection tasks?

Yes **No**

23. Do you feel that the observers did a good job?

Yes **No**

24. On a scale from one to ten, what rating would you give the observers (1 = poor, 10 = excellent)?

____

APPENDIX G. INSPECTOR CHARACTERIZATION PROTOCOLS

PROTOCOL FOR THE ADMINISTRATION OF THE SELF-REPORT QUESTIONNAIRE

The following will outline the standard protocol that must be followed during the administration of the self-report questionnaire:

1. Observer reads the following:

   "I am now going to ask you to complete a self-report questionnaire. Before we go any further, I would like to assure you that all answers provided on this questionnaire are strictly confidential. As you can see, the answers provided in this questionnaire can only be identified by an inspector ID number. This ID number will not be linked to you or to your inspection agency in any way. With this strict confidentiality in mind, I ask that you answer all questions as honestly as you can. If, however, you feel that a question is too personal for you to answer or you simply don't want to answer the question, feel free to skip it and go on to the next one. Before we go any further, do you have any questions about anything I have said so far?"

2. Observer reads the following:

   "The survey has been developed to assess the general condition of inspectors. Additionally, this survey will give us some insight into your views on the specific operation of your inspection agency. Please take your time filling out this survey and feel free to ask me any questions that you may have. When I can, I will answer them as best I can. Again, let me remind you that all information that you provide is strictly confidential and all questions on this survey are completely voluntary."

3. Observer writes the inspector's ID on the self-report questionnaire and gives the questionnaire to the inspector. Observers should busy themselves so as not to appear to be watching the inspector complete the questionnaire. Observers should, however, remain within close proximity to the inspector in order to answer appropriate questions.

4. Observer places the completed questionnaire into the inspector's folder and reads the following:

   "Thank you for taking the time to complete the questionnaire. The answers you have provided will prove to be invaluable in this study."

PROTOCOL FOR THE ADMINISTRATION OF THE NEAR VISUAL ACUITY TEST

The following will outline the standard protocol that must be followed during the administration of the "Logarithmic Near Visual Acuity Chart 2000" test:

1. Observer reads the following:

   "I am now going to ask you to take what is known as the "Logarithmic Near Visual Acuity Chart 2000" vision test. This test is similar to standardized vision tests commonly given in a doctor's office. Please recall that all test results are strictly confidential. What I will ask you to do during this test is to hold this small card 16 inches from your eyes as measured by this string and to read as much of the card as you can. Each eye will be tested individually and the card will be different for each eye. You will start by reading across the chart slowly, letter by letter, beginning with the first letter in the top row. Only one reading of each letter is allowed, so it is important to be careful while reading. When you have difficulty reading a letter, you are encouraged to guess. I will let you know when you can stop the test. To ensure that I am able to record your answers as fast as you read them, I ask that you stop at the end of each line until I direct you to start the next line. Do you have any questions about what I have said so far?"

2. Observer reads the following after handing the card to the inspector with CHART 1 facing up:

   "Please hold the black cord in your left hand directly next to your left eye and place the card in the holder on the table. Cover your left eye with this occluder and begin reading the card from the top left as I had described. Remember to stop after reading each line until I tell you to go on to the next line."

3. On the prepared form, observer circles each letter when it is correctly read. Stop the test when it is clear that the inspector is no longer able to see the letters.

4. On the prepared form, observer records the acuity (given on the right side of the chart) for the last line in which the inspector got at least three letters correct. Observer also records this value on the Palm Pilot form where appropriate.

5. Observer reads the following after handing the card to the inspector with CHART 2 facing up:

   "Please hold the black cord in your left hand directly next to your left eye and place the card in the holder on the table. Cover your right eye with this occluder and begin reading the card from the top left as I had described. Remember to stop after reading each line until I tell you to go on to the next line."

6. On the prepared form, observer circles each letter when it is correctly read. Observer stops the test when it is clear that the inspector is no longer able to see the letters.

7. On the prepared form, observer records the acuity (given on the right side of the chart) for the last line in which the inspector got at least three letters correct. Observer also records this value on the Palm Pilot form where appropriate.

8. Observer reads the following:

   "Do you have any questions about this test?"

9. Observer returns the card to its protective bag.

PROTOCOL FOR THE ADMINISTRATION OF THE DISTANCE VISUAL ACUITY TEST

The following will outline the standard protocol that must be followed during the administration of the "Logarithmic Visual Acuity Chart 2000" test:

1. Observer reads the following:

   "I am now going to ask you to take what is known as the logarithmic visual acuity chart "2000" vision test. This test is similar to standardized vision tests commonly given in a doctor's office. Please recall that all test results are strictly confidential. What I will ask you to do during this test is to stand 13 feet from the vision chart and to read as much of the chart as you can. Each eye will be tested individually and the chart will be different for each eye. You will start by reading across the chart slowly, letter by letter, beginning with the first letter in the top row. Only one reading of each letter is allowed, so it is important to be careful while reading. When you have difficulty reading a letter, you are encouraged to guess. I will let you know when you can stop the test. To ensure that I am able to record your answers as fast as you read them, I ask that you stop at the end of each line until I direct you to start the next line. Do you have any questions about what I have said so far?"

2. Observer gives the inspector the occluder and asks the inspector to stand behind the designated line, facing away from the light box.

3. Observer places CHART 1 in the light box and turns on the light box.

4. Observer reads the following:

   "Would you please turn around and cover your left eye with the occluder and begin reading the chart from the top left as I had described. Remember to stop after reading each line until I tell you to go on to the next line."

5. On the prepared form, observer circles each letter when it is correctly read. Observer stops the test when it is clear that the inspector is no longer able to see the letters.

6. On the prepared form, observer records the acuity (given on the right side of the chart) for the last line in which the inspector got at least three letters correct. Observer also records this value on the Palm Pilot form where appropriate.

7. Observer reads the following:

   "Would you please face away from the chart while I change the chart."

8. Observer places CHART 2 in the light box.

9. Observer reads the following:

"Would you please turn around and cover your right eye with the occluder and begin reading the chart from the top left as I had described. Remember to stop after reading each line until I tell you to go on to the next line."

10. On the prepared form, observer circles each letter when it is correctly read. Observer stops the test when it is clear that the inspector is no longer able to see the letters.

11. On the prepared form, observer records the acuity (given on the right side of the chart) for the last line in which the inspector got at least three letters correct. Observer also records this value on the Palm Pilot form where appropriate.

12. Turn off the light box and place both charts in the back of the light box.

PROTOCOL FOR THE ADMINISTRATION OF THE PV-16 COLOR VISION TEST

The following will outline the standard protocol that must be followed during the administration of the PV-16 quantitative color vision test:

1. Observer reads the following:

   "I am now going to ask you to take what is known as the PV-16 quantitative color vision test. Quantitative measurement of color vision is an important diagnostic test used to define the degree of hereditary color vision deficiency and to evaluate deficient color vision from acquired disorders. The goal of this test is to establish what your color vision is. Please remember that all results obtained during this experiment are strictly confidential. What you will be asked to do during this test is to arrange these 16 caps in order. The order will be established by sequencing the caps in such a manner that adjacent caps are closest in color. When we begin, I will give you what is known as the pilot cap. This cap will serve as your starting point. You will be asked to complete this test a total of four times. Do you have any questions about what I have said so far?"

2. Observer removes the caps from the protective case.

3. Observer places the reduction rings on all of the caps.

4. Observer locates the pilot cap.

5. Observer randomly mixes up the caps face up on the table.

6. Observer reads the following:

   "Would you now sequence the caps as I had previously described such that adjacent caps are closest in color, beginning with the pilot cap."

7. After the inspector lines them up, starting with the pilot cap, observer completes the prepared form (Precision Vision form) by turning the caps over such that the inspector cannot see the numbers or the prepared form.

8. Observer mixes up the caps face up on the table and reads the following:

   "Would you now sequence the caps as I had previously described such that adjacent caps are closest in color, beginning with the pilot cap."

9. While the inspector is completing the second trial, observer notes test results on Palm Pilot laboratory test form, noting the following information:

   - Number of minor confusions (number of adjacent caps that are reversed).

- Number of crossings across color circle (number of times there is an error other than a minor confusion).
- Type of color vision deficiency (if any).

10. After inspector lines them up, starting with the pilot cap, observer completes the prepared form (Precision Vision form) by turning the caps over such that the inspector cannot see the numbers or the prepared form.

11. Observer removes the reduction rings.

12. Observer repeats steps 6 through 9 two more times.

13. Observer reads the following:

    "Do you have any questions for me about the PV-16 quantitative color vision test?"

14. Observer records the inspector's ID on the prepared form (Precision Vision form) and initials the bottom of the form. Observer places prepared form in the inspector's folder.

15. Observer places all of the caps into the protective case.

APPENDIX H. PRE-EXPERIMENT EVALUATION FORMS

TASK A PRE-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Date: __________
3. Time: __________

4. How long has it been since you completed a Routine Inspection of a bridge of this type? (Note: Record time in weeks.) ___________

5. What accessibility equipment/vehicles would you normally use for a Routine Inspection of this type?
   - ___ Snooper
   - ___ Lift
   - ___ Ladder
   - ___ Scaffold
   - ___ Climbing Equipment
   - ___ Permanent Inspection Platform
   - ___ Movable Platform
   - ___ None
   - ___ Other: ______________________________________

6. Describe, as completely as you can, the type of construction used on this bridge.
   - ___ Steel through girder
   - ___ Plate girder
   - ___ Riveted
   - ___ Fracture-critical
   - ___ Cast-in-place concrete slab
   - ___ Simply supported
   - ___ Skewed
   - ___ Floor beams
   - ___ Asphalt overlay
   - ___ Other: ______________________________________

7. Given a bridge of this type, general condition, and age, what types of problems would you expect to find?
   - ___ Cracked/debonded/loose asphalt
   - ___ Steel corrosion/section loss
   - ___ Paint deterioration
   - ___ Concrete deterioration
   - ___ Inadequate concrete cover
   - ___ Impact damage
   - ___ Fatigue cracking
   - ___ Settlement cracking of abutments
   - ___ Missing rivets/rivetheads
   - ___ Underside deck cracking
   - ___ Leaching

___ Leakage
___ Other: ____________________________________

8. Given the available equipment and the defined tasks, how long do you think you would normally spend on this inspection? (Note: Record time in minutes.) ____________

9. How rested are you?

1	2	3	4	5	6	7	8	9
Very Tired								Very Rested

10. Would you normally inspect under these weather conditions?
    Yes No

11. General Observer Notes:

TASK B PRE-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Date: __________
3. Time: __________

4. How long has it been since you completed a Routine Inspection of a bridge of this type? (Note: Record time in weeks.) ____________

5. What accessibility equipment/vehicles would you normally use for a Routine Inspection of this type?
   - ___ Snooper
   - ___ Lift
   - ___ Ladder
   - ___ Scaffold
   - ___ Climbing Equipment
   - ___ Permanent Inspection Platform
   - ___ Movable Platform
   - ___ None
   - ___ Other: ______________________________________

6. Describe, as completely as you can, the type of construction used on this bridge.
   - ___ Concrete T-beam
   - ___ Cast-in-place reinforced concrete
   - ___ Simply supported
   - ___ Other: ______________________________________

7. Given a bridge of this type, general condition, and age, what types of problems would you expect to find?
   - ___ Concrete deterioration
   - ___ Inadequate concrete cover
   - ___ Spalling
   - ___ Freeze/thaw damage
   - ___ Impact damage
   - ___ Delaminations
   - ___ Settlement cracking of abutments
   - ___ Expansion joint deterioration
   - ___ Underside deck cracking
   - ___ Leaching
   - ___ Leakage
   - ___ Other: ______________________________________

8. Given the available equipment and the defined tasks, how long do you think you would normally spend on this inspection? (Note: Record time in minutes.) ____________

9. How rested are you?

1	2	3	4	5	6	7	8	9
Very Tired								Very Rested

10. Would you normally inspect under these weather conditions?

Yes No

11. General Observer Notes:

TASK C PRE-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Date: __________
3. Time: __________

SKIP the following if AFTER another T-beam task:

4. How long has it been since you completed a Routine Inspection of a bridge of this type? (Note: Record time in weeks.) ____________

SKIP the following if AFTER another T-beam task:

5. What accessibility equipment/vehicles would you normally use for a Routine Inspection of this type?
   - ___ Snooper
   - ___ Lift
   - ___ Ladder
   - ___ Scaffold
   - ___ Climbing Equipment
   - ___ Permanent Inspection Platform
   - ___ Movable Platform
   - ___ None
   - ___ Other: ______________________________________

SKIP the following if AFTER another T-beam task:

6. Describe, as completely as you can, the type of construction used on this bridge.
   - ___ Concrete T-beam
   - ___ Cast-in-place reinforced concrete
   - ___ Simply supported
   - ___ Skewed
   - ___ Other: ______________________________________

SKIP the following if AFTER another T-beam task:

7. Given a bridge of this type, general condition, and age, what types of problems would you expect to find?
   - ___ Concrete deterioration
   - ___ Inadequate concrete cover
   - ___ Spalling
   - ___ Freeze/thaw damage
   - ___ Impact damage
   - ___ Delaminations
   - ___ Settlement cracking of abutments
   - ___ Expansion joint deterioration
   - ___ Underside deck cracking
   - ___ Leaching
   - ___ Leakage
   - ___ Other: ______________________________________

SKIP the following if AFTER another T-beam task:

8. Given the available equipment and the defined tasks, how long do you think you would normally spend on this inspection? (Note: Record time in minutes.) ____________

9. How rested are you?

1	2	3	4	5	6	7	8	9
Very Tired								Very Rested

10. Would you normally inspect under these weather conditions?

    Yes   No

11. General Observer Notes:

TASK D PRE-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Date: __________
3. Time: __________

4. How long has it been since you completed a Routine Inspection of a bridge of this type? (Note: Record time in weeks.) ____________

5. What accessibility equipment/vehicles would you normally use for a Routine Inspection of this type?
   ___ Snooper
   ___ Lift
   ___ Ladder
   ___ Scaffold
   ___ Climbing Equipment
   ___ Permanent Inspection Platform
   ___ Movable Platform
   ___ None
   ___ Other: ______________________________________

6. Describe, as completely as you can, the type of construction used on this bridge.
   ___ Concrete rigid frame
   ___ Skewed
   ___ Other: ______________________________________

7. Given a bridge of this type, general condition, and age, what types of problems would you expect to find?
   ___ Concrete deterioration
   ___ Inadequate concrete cover
   ___ Spalling
   ___ Freeze/thaw damage
   ___ Impact damage
   ___ Delaminations
   ___ Settlement cracking of abutments
   ___ Expansion joint deterioration
   ___ Underside deck (arch) cracking
   ___ Leaching
   ___ Leakage
   ___ Other: ______________________________________

8. Given the available equipment and the defined tasks, how long do you think you would normally spend on this inspection? (Note: Record time in minutes.) ____________

9. How rested are you?

1	2	3	4	5	6	7	8	9
Very Tired								Very Rested

10. Would you normally inspect under these weather conditions?

Yes No

11. General Observer Notes:

TASK E PRE-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Date: __________
3. Time: __________

4. How long has it been since you completed a Routine Inspection of a bridge of this type? (Note: Record time in weeks.) ___________

5. What accessibility equipment/vehicles would you normally use for a Routine Inspection of this type?
   ___ Snooper
   ___ Lift
   ___ Ladder
   ___ Scaffold
   ___ Climbing Equipment
   ___ Permanent Inspection Platform
   ___ Movable Platform
   ___ None
   ___ Other: ______________________________

6. Describe, as completely as you can, the type of construction used on this bridge.
   ___ Steel plate girder
   ___ Riveted
   ___ Cast-in-place concrete slab
   ___ Simply supported
   ___ Skewed
   ___ Floor beams and sway frames
   ___ Asphalt overlay
   ___ Other: ______________________________

7. Given a bridge of this type, general condition, and age, what types of problems would you expect to find?
   ___ Cracked/debonded/loose asphalt
   ___ Steel corrosion and section loss
   ___ Paint deterioration
   ___ Concrete deterioration
   ___ Inadequate concrete cover
   ___ Impact damage
   ___ Settlement cracking of abutments
   ___ Missing rivets/rivetheads
   ___ Underside deck cracking
   ___ Fatigue cracking of tack welds
   ___ Leaching
   ___ Leakage
   ___ Other: ______________________________

8. Given the available equipment and the defined tasks, how long do you think you would normally spend on this inspection? (Note: Record time in minutes.) ____________

9. How rested are you?

1	2	3	4	5	6	7	8	9
Very Tired								Very Rested

10. Would you normally inspect under these weather conditions?

    Yes No

11. General Observer Notes:

TASK F PRE-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Date: __________
3. Time: __________

4. How long has it been since you completed an In-Depth Inspection of this type on a bridge of this type? (Note: Record time in weeks.) ____________

5. What accessibility equipment/vehicles would you normally use for an In-Depth Inspection of this type?
   ___ Snooper
   ___ Lift
   ___ Ladder
   ___ Scaffold
   ___ Climbing Equipment
   ___ Permanent Inspection Platform
   ___ Movable Platform
   ___ None
   ___ Other: ______________________________________

6. Have you ever completed an inspection from a lift similar to this one?
   Yes No

7. Given the available equipment and the defined tasks, how long do you think you would normally spend on this inspection? (Note: Record time in minutes.) ____________

8. How rested are you?

1	2	3	4	5	6	7	8	9
Very Tired								Very Rested

9. Would you normally inspect under these weather conditions?
   Yes No

10. General Observer Notes:

TASK G PRE-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Date: __________
3. Time: __________

4. Was Task 1 or Task 2 performed first? Task 1 Task 2

5. How long has it been since you completed a Routine Inspection of a bridge of this type? (Note: Record time in weeks.) ___________

6. What accessibility equipment/vehicles would you normally use for a Routine Inspection of this type?
   - ___ Snooper
   - ___ Lift
   - ___ Ladder
   - ___ Scaffold
   - ___ Climbing Equipment
   - ___ Permanent Inspection Platform
   - ___ Movable Platform
   - ___ None
   - ___ Other: ____________________________________

7. Describe, as completely as you can, the type of construction used on this bridge.
   - ___ Steel girder
   - ___ Welded plate girder
   - ___ Multi-girder
   - ___ Reinforced concrete deck
   - ___ Continuous superstructure
   - ___ Rocker bearings
   - ___ Concrete piers
   - ___ Single-angle cross-bracing
   - ___ Composite construction
   - ___ Other: ____________________________________

8. Given a bridge of this type, general condition, and age, what types of problems would you expect to find?
   - ___ Steel corrosion/section loss
   - ___ Fatigue cracking
   - ___ Concrete deterioration
   - ___ Impact damage
   - ___ Paint deterioration
   - ___ Locked bearings
   - ___ Underside deck cracking
   - ___ Deck delaminations
   - ___ Expansion joint deterioration

___ Leaching
___ Leakage
___ Other: ___________________________________

9. Given the available equipment and the defined tasks, how long do you think you would normally spend on this inspection? (Note: Record time in minutes.) ___________

10. How rested are you?

1	2	3	4	5	6	7	8	9
Very Tired								Very Rested

11. Would you normally inspect under these weather conditions?
    Yes No

12. General Observer Notes:

TASK H PRE-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Date: __________
3. Time: __________

4. How long has it been since you completed an In-Depth Inspection of this type on a bridge of this type? (Note: Record time in weeks.) ____________

5. What accessibility equipment/vehicles would you normally use for an In-Depth inspection of this type?
   ___ Snooper
   ___ Lift
   ___ Ladder
   ___ Scaffold
   ___ Climbing Equipment
   ___ Permanent Inspection Platform
   ___ Movable Platform
   ___ None
   ___ Other: ______________________________________

6. Have you ever completed an inspection from a lift similar to this one?
   Yes No

7. How often do you perform inspections at heights above 40 ft? (Note: Record amount in frequency per year.) ____________

8. Describe, as completely as you can, the type of construction used on this bridge.
   ___ Steel girder
   ___ Welded plate girder
   ___ Multi-girder
   ___ Reinforced concrete deck
   ___ Continuous superstructure
   ___ Rocker bearings
   ___ Concrete piers
   ___ Single-angle cross-bracing
   ___ Composite construction
   ___ Other: ______________________________________

9. Given a bridge of this type, general condition, and age, what types of problems would you expect to find?
   ___ Steel corrosion/section loss
   ___ Fatigue cracking
   ___ Concrete deterioration
   ___ Impact damage
   ___ Paint deterioration

___ Locked bearings
___ Underside deck cracking
___ Deck delaminations
___ Expansion joint deterioration
___ Leaching
___ Leakage
___ Other: ______________________________________

10. Given the available equipment and the defined tasks, how long do you think you would normally spend on this inspection? (Note: Record time in minutes.) ____________

11. How rested are you?

1	2	3	4	5	6	7	8	9
Very Tired								Very Rested

12. Would you normally inspect under these weather conditions?

    Yes No

13. General Observer Notes:

TASK I PRE-EXPERIMENT EVALUATION FORM

1. Team ID: __________
2. Date: __________
3. Time: __________

4. How long has it been since you completed a Routine Inspection of a bridge of this type (Inspector #1)? (Note: Record time in weeks.) ____________

5. How long has it been since you completed a Routine Inspection of a bridge of this type (Inspector #2)? (Note: Record time in weeks.) ____________

6. How long did you spend preparing to complete this inspection prior to arriving at the bridge site? (Note: Record time in man-hours.) ____________

7. What accessibility equipment/vehicles would you normally use for a Routine Inspection of this type?
   ___ Snooper
   ___ Lift
   ___ Ladder
   ___ Scaffold
   ___ Climbing Equipment
   ___ Permanent Inspection Platform
   ___ Movable Platform
   ___ None
   ___ Other: ______________________________________

8. Given a bridge of this type, general condition, and age, what types of problems would you expect to find?
   ___ Steel corrosion/section loss
   ___ Fatigue cracking
   ___ Concrete deterioration
   ___ Impact damage
   ___ Paint deterioration
   ___ Locked bearings
   ___ Underside deck cracking
   ___ Deck delaminations
   ___ Expansion joint deterioration
   ___ Leaching
   ___ Leakage
   ___ Other: ______________________________________

9. Given the available equipment and the defined tasks, how long do you think you would normally spend on this inspection? (Note: Record team time in minutes.) ____________

10. How rested are you (Inspector #1)?

1	2	3	4	5	6	7	8	9
Very Tired								Very Rested

11. How rested are you (Inspector #2)?

1	2	3	4	5	6	7	8	9
Very Tired								Very Rested

12. Would you normally inspect under these weather conditions?

Yes No

13. General Observer Notes:

APPENDIX I. POST-EXPERIMENT EVALUATION FORMS

TASK A POST-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Time: __________
3. How similar were these inspection tasks to the tasks performed in your normal Routine Inspections?
   1 2 3 4 5 6 7 8 9
   Not Similar — Very Similar
4. Did this task do an accurate job of measuring your inspection skills?
   1 2 3 4 5 6 7 8 9
   Very Inaccurate — Very Accurate
5. How rested are you?
   1 2 3 4 5 6 7 8 9
   Very Tired — Very Rested
6. How well did you understand the instructions you were given?
   1 2 3 4 5 6 7 8 9
   Very Poorly — Very Well
7. How accessible do you feel the various bridge components were?
   1 2 3 4 5 6 7 8 9
   Very Inaccessible — Very Accessible
8. Were there any inaccessible parts of the bridge that you would have liked to inspect, but could not? ______________________________
9. How well do you feel that this bridge has been maintained?
   1 2 3 4 5 6 7 8 9
   Very Poorly — Very Well
10. How complex was this bridge?
    1 2 3 4 5 6 7 8 9
    Very Simple — Very Complex
11. Do you think my presence as an observer had any influence on your inspection?
    1 2 3 4 5 6 7 8 9
    No Influence — Great Influence
12. Did you feel rushed while completing this task?
    1 2 3 4 5 6 7 8 9
    Not Rushed — Very Rushed

13. What was your effort level on this task in comparison with your normal effort level?

1 2 3 4 5 6 7 8 9

Much Lower — Average — Much Greater

14. How thorough were you in completing this task in comparison to your normal inspection?

1 2 3 4 5 6 7 8 9

Less Thorough — Average — More Thorough

15. Did you have any specific distractions that adversely affected your inspection?
    - ___ Hunger
    - ___ "Nature calls"
    - ___ Access equipment stability
    - ___ Height
    - ___ Temperature
    - ___ Humidity
    - ___ Wind
    - ___ Traffic
    - ___ Noise
    - ___ Other: ______________________________

16. What other tools would you have normally used during an inspection of this type?

    ____

17. Are there any follow-up inspection or maintenance actions that you would recommend to your supervisor? ____

18. Is there anything about this task or your performance that you would like me to make note of? ____

19. General Observer Notes:

TASK B POST-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Time: __________

3. How similar were these inspection tasks to the tasks performed in your normal Routine Inspections?

   1 2 3 4 5 6 7 8 9

   Not Similar … Very Similar

4. Did this task do an accurate job of measuring your inspection skills?

   1 2 3 4 5 6 7 8 9

   Very Inaccurate … Very Accurate

5. How rested are you?

   1 2 3 4 5 6 7 8 9

   Very Tired … Very Rested

6. How well did you understand the instructions you were given?

   1 2 3 4 5 6 7 8 9

   Very Poorly … Very Well

7. How accessible do you feel the various bridge components were?

   1 2 3 4 5 6 7 8 9

   Very Inaccessible … Very Accessible

8. Were there any inaccessible parts of the bridge that you would have liked to inspect, but could not? ____

9. How well do you feel that this bridge has been maintained?

   1 2 3 4 5 6 7 8 9

   Very Poorly … Very Well

10. How complex was this bridge?

    1 2 3 4 5 6 7 8 9

    Very Simple … Very Complex

11. Do you think my presence as an observer had any influence on your inspection?

    1 2 3 4 5 6 7 8 9

    No Influence … Great Influence

12. Did you feel rushed while completing this task?

    1 2 3 4 5 6 7 8 9

    Not Rushed … Very Rushed

13. What was your effort level on this task in comparison with your normal effort level?

1	2	3	4	5	6	7	8	9
Much Lower				Average				Much Greater

14. How thorough were you in completing this task in comparison to your normal inspection?

1	2	3	4	5	6	7	8	9
Less Thorough				Average				More Thorough

15. Did you have any specific distractions that adversely affected your inspection?

___ Hunger
___ "Nature calls"
___ Access equipment stability
___ Height
___ Temperature
___ Humidity
___ Wind
___ Traffic
___ Noise
___ Other: ______________________________

16. What other tools would you have normally used during an inspection of this type?

____

17. Are there any follow-up inspection or maintenance actions that you would recommend to your supervisor? ____

18. Is there anything about this task or your performance that you would like me to make note of? ____

19. General Observer Notes:

TASK C POST-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Time: __________

3. How similar were these inspection tasks to the tasks performed in your normal Routine Inspections?

   1 2 3 4 5 6 7 8 9

   Not Similar — Very Similar

SKIP the following if AFTER another T-beam task:

4. Did this task do an accurate job of measuring your inspection skills?

   1 2 3 4 5 6 7 8 9

   Very Inaccurate — Very Accurate

5. How rested are you?

   1 2 3 4 5 6 7 8 9

   Very Tired — Very Rested

6. How well did you understand the instructions you were given?

   1 2 3 4 5 6 7 8 9

   Very Poorly — Very Well

7. How accessible do you feel the various bridge components were?

   1 2 3 4 5 6 7 8 9

   Very Inaccessible — Very Accessible

8. Were there any inaccessible parts of the bridge that you would have liked to inspect, but could not? ______________________________

9. How well do you feel that this bridge has been maintained?

   1 2 3 4 5 6 7 8 9

   Very Poorly — Very Well

SKIP the following if AFTER another T-beam task:

10. How complex was this bridge?

    1 2 3 4 5 6 7 8 9

    Very Simple — Very Complex

11. Do you think my presence as an observer had any influence on your inspection?

    1 2 3 4 5 6 7 8 9

    No Influence — Great Influence

12. Did you feel rushed while completing this task?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

13. What was your effort level on this task in comparison with your normal effort level?

1	2	3	4	5	6	7	8	9
Much Lower				Average				Much Greater

14. How thorough were you in completing this task in comparison to your normal inspection?

1	2	3	4	5	6	7	8	9
Less Thorough				Average				More Thorough

15. Did you have any specific distractions that adversely affected your inspection?
    ___ Hunger
    ___ "Nature calls"
    ___ Access equipment stability
    ___ Height
    ___ Temperature
    ___ Humidity
    ___ Wind
    ___ Traffic
    ___ Noise
    ___ Other: ______________________________

16. What other tools would you have normally used during an inspection of this type?
    ____

17. Are there any follow-up inspection or maintenance actions that you would recommend to your supervisor? ____

18. Is there anything about this task or your performance that you would like me to make note of? ____

19. General Observer Notes:

TASK D POST-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Time: __________

3. How similar were these inspection tasks to the tasks performed in your normal Routine Inspections?

   1 2 3 4 5 6 7 8 9

   Not Similar ... Very Similar

4. Did this task do an accurate job of measuring your inspection skills?

   1 2 3 4 5 6 7 8 9

   Very Inaccurate ... Very Accurate

5. How rested are you?

   1 2 3 4 5 6 7 8 9

   Very Tired ... Very Rested

6. How well did you understand the instructions you were given?

   1 2 3 4 5 6 7 8 9

   Very Poorly ... Very Well

7. How accessible do you feel the various bridge components were?

   1 2 3 4 5 6 7 8 9

   Very Inaccessible ... Very Accessible

8. Were there any inaccessible parts of the bridge that you would have liked to inspect, but could not? ____

9. How well do you feel that this bridge has been maintained?

   1 2 3 4 5 6 7 8 9

   Very Poorly ... Very Well

10. How complex was this bridge?

    1 2 3 4 5 6 7 8 9

    Very Simple ... Very Complex

11. Do you think my presence as an observer had any influence on your inspection?

    1 2 3 4 5 6 7 8 9

    No Influence ... Great Influence

12. Did you feel rushed while completing this task?

    1 2 3 4 5 6 7 8 9

    Not Rushed ... Very Rushed

13. What was your effort level on this task in comparison with your normal effort level?

1	2	3	4	5	6	7	8	9
Much Lower				Average			Much Greater	

14. How thorough were you in completing this task in comparison to your normal inspection?

1	2	3	4	5	6	7	8	9
Less Thorough				Average			More Thorough	

15. Did you have any specific distractions that adversely affected your inspection?

___ Hunger
___ "Nature calls"
___ Access equipment stability
___ Height
___ Temperature
___ Humidity
___ Wind
___ Traffic
___ Noise
___ Other: ______________________________

16. What other tools would you have normally used during an inspection of this type?

____

17. Are there any follow-up inspection or maintenance actions that you would recommend to your supervisor? ____

18. Is there anything about this task or your performance that you would like me to make note of? ____

19. General Observer Notes:

TASK E POST-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Time: __________

3. How similar were these inspection tasks to the tasks performed in your normal Routine Inspections?

   1 2 3 4 5 6 7 8 9

   Not Similar — Very Similar

4. Did this task do an accurate job of measuring your inspection skills?

   1 2 3 4 5 6 7 8 9

   Very Inaccurate — Very Accurate

5. How rested are you?

   1 2 3 4 5 6 7 8 9

   Very Tired — Very Rested

6. How well did you understand the instructions you were given?

   1 2 3 4 5 6 7 8 9

   Very Poorly — Very Well

7. How accessible do you feel the various bridge components were?

   1 2 3 4 5 6 7 8 9

   Very Inaccessible — Very Accessible

8. Were there any inaccessible parts of the bridge that you would have liked to inspect, but could not? ____

9. How well do you feel that this bridge has been maintained?

   1 2 3 4 5 6 7 8 9

   Very Poorly — Very Well

10. How complex was this bridge?

    1 2 3 4 5 6 7 8 9

    Very Simple — Very Complex

11. Do you think my presence as an observer had any influence on your inspection?

    1 2 3 4 5 6 7 8 9

    No Influence — Great Influence

12. Did you feel rushed while completing this task?

    1 2 3 4 5 6 7 8 9

    Not Rushed — Very Rushed

13. What was your effort level on this task in comparison with your normal effort level?

1	2	3	4	5	6	7	8	9
Much Lower				Average			Much Greater	

14. How thorough were you in completing this task in comparison to your normal inspection?

1	2	3	4	5	6	7	8	9
Less Thorough				Average			More Thorough	

15. Did you have any specific distractions that adversely affected your inspection?
    ___ Hunger
    ___ "Nature calls"
    ___ Access equipment stability
    ___ Height
    ___ Temperature
    ___ Humidity
    ___ Wind
    ___ Traffic
    ___ Noise
    ___ Other: ______________________________

16. What other tools would you have normally used during an inspection of this type?
    ____

17. Are there any follow-up inspection or maintenance actions that you would recommend to your supervisor? ____

18. Is there anything about this task or your performance that you would like me to make note of? ____

19. General Observer Notes:

TASK F POST-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Time: __________

3. How similar were these inspection tasks to the tasks performed in your normal In-Depth Inspections?

   1 2 3 4 5 6 7 8 9

   Not Similar … Very Similar

4. Did this task do an accurate job of measuring your inspection skills?

   1 2 3 4 5 6 7 8 9

   Very Inaccurate … Very Accurate

5. How rested are you?

   1 2 3 4 5 6 7 8 9

   Very Tired … Very Rested

6. How well did you understand the instructions you were given?

   1 2 3 4 5 6 7 8 9

   Very Poorly … Very Well

7. How accessible do you feel the various bridge components were?

   1 2 3 4 5 6 7 8 9

   Very Inaccessible … Very Accessible

8. Were there any inaccessible parts of the bridge that you would have liked to inspect, but could not? ____

9. How well do you feel that this bridge has been maintained?

   1 2 3 4 5 6 7 8 9

   Very Poorly … Very Well

10. How complex was this bridge?

    1 2 3 4 5 6 7 8 9

    Very Simple … Very Complex

11. Do you think my presence as an observer had any influence on your inspection?

    1 2 3 4 5 6 7 8 9

    No Influence … Great Influence

12. Do you feel the working height influenced your inspection performance?

    1 2 3 4 5 6 7 8 9

    No Influence … Great Influence

13. How adequate do you feel the light level was?

1	2	3	4	5	6	7	8	9
Not Adequate								Very Adequate

14. On average, how close do you think you got to the components you were inspecting? (Note: Record distance in inches.) ____________

15. Do you feel you were able to get the proper viewing angle?

1	2	3	4	5	6	7	8	9
Never								Always

16. Did you feel rushed while completing this task?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

17. What was your effort level on this task in comparison with your normal effort level?

1	2	3	4	5	6	7	8	9
Much Lower				Average				Much Greater

18. How thorough were you in completing this task in comparison to your normal inspection?

1	2	3	4	5	6	7	8	9
Less Thorough				Average				More Thorough

19. Did you have any specific distractions that adversely affected your inspection?
    - ___ Hunger
    - ___ "Nature calls"
    - ___ Access equipment stability
    - ___ Height
    - ___ Temperature
    - ___ Humidity
    - ___ Wind
    - ___ Traffic
    - ___ Noise
    - ___ Other: ______________________________

20. What other tools would you have normally used during an inspection of this type?

    ____

21. Are there any follow-up inspection or maintenance actions that you would recommend to your supervisor? ____

22. Is there anything about this task or your performance that you would like me to make note of? ____

23. General Observer Notes:

TASK G POST-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Time: __________

3. How similar were these inspection tasks to the tasks performed in your normal Routine Inspections?

1	2	3	4	5	6	7	8	9
Not Similar								Very Similar

4. Did this task do an accurate job of measuring your inspection skills?

1	2	3	4	5	6	7	8	9
Very Inaccurate								Very Accurate

5. How rested are you?

1	2	3	4	5	6	7	8	9
Very Tired								Very Rested

6. How well did you understand the instructions you were given?

1	2	3	4	5	6	7	8	9
Very Poorly								Very Well

7. How accessible do you feel the various bridge components were?

1	2	3	4	5	6	7	8	9
Very Inaccessible								Very Accessible

8. Were there any inaccessible parts of the bridge that you would have liked to inspect, but could not?

9. How well do you feel that this bridge has been maintained?

1	2	3	4	5	6	7	8	9
Very Poorly								Very Well

10. How complex was this bridge?

1	2	3	4	5	6	7	8	9
Very Simple								Very Complex

11. Do you think my presence as an observer had any influence on your inspection?

1	2	3	4	5	6	7	8	9
No Influence								Great Influence

12. Did you feel rushed while completing this task?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

13. What was your effort level on this task in comparison with your normal effort level?

1	2	3	4	5	6	7	8	9
Much Lower				Average				Much Greater

14. How thorough were you in completing this task in comparison to your normal inspection?

1	2	3	4	5	6	7	8	9
Less Thorough				Average				More Thorough

15. Did you have any specific distractions that adversely affected your inspection?

___ Hunger
___ "Nature calls"
___ Access equipment stability
___ Height
___ Temperature
___ Humidity
___ Wind
___ Traffic
___ Noise
___ Other: ______________________________

16. What other tools would you have normally used during an inspection of this type?

____

17. Are there any follow-up inspection or maintenance actions that you would recommend to your supervisor? ____

18. Is there anything about this task or your performance that you would like me to make note of? ____

19. General Observer Notes:

TASK H POST-EXPERIMENT EVALUATION FORM

1. Inspector ID: __________
2. Time: __________

3. How similar were these inspection tasks to the tasks performed in your normal In-Depth Inspections?

   1 2 3 4 5 6 7 8 9

   Not Similar — Very Similar

4. Did this task do an accurate job of measuring your inspection skills?

   1 2 3 4 5 6 7 8 9

   Very Inaccurate — Very Accurate

5. How rested are you?

   1 2 3 4 5 6 7 8 9

   Very Tired — Very Rested

6. How well did you understand the instructions you were given?

   1 2 3 4 5 6 7 8 9

   Very Poorly — Very Well

7. How accessible do you feel the various bridge components were?

   1 2 3 4 5 6 7 8 9

   Very Inaccessible — Very Accessible

8. Were there any inaccessible parts of the bridge that you would have liked to inspect, but could not? ____

9. How well do you feel that this bridge has been maintained?

   1 2 3 4 5 6 7 8 9

   Very Poorly — Very Well

10. How complex was this bridge?

    1 2 3 4 5 6 7 8 9

    Very Simple — Very Complex

11. Do you think my presence as an observer had any influence on your inspection?

    1 2 3 4 5 6 7 8 9

    No Influence — Great Influence

12. Do you feel the working height influenced your inspection performance?

    1 2 3 4 5 6 7 8 9

    No Influence — Great Influence

13. How adequate do you feel the light level was?

1	2	3	4	5	6	7	8	9
Not Adequate								Very Adequate

14. On average, how close do you think you got to the welds you were inspecting? (Note: Record distance in inches.) ___________

15. Do you feel you were able to get the proper viewing angle for the components you were inspecting?

1	2	3	4	5	6	7	8	9
Never								Always

16. Did you feel rushed while completing this task?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

17. What was your effort level on this task in comparison with your normal effort level?

1	2	3	4	5	6	7	8	9
Much Lower				Average				Much Greater

18. How thorough were you in completing this task in comparison to your normal inspection?

1	2	3	4	5	6	7	8	9
Less Thorough				Average				More Thorough

19. Did you have any specific distractions that adversely affected your inspection?
    ___ Hunger
    ___ "Nature calls"
    ___ Access equipment stability
    ___ Height
    ___ Temperature
    ___ Humidity
    ___ Wind
    ___ Traffic
    ___ Noise
    ___ Other: ______________________

20. What other tools would you have normally used during an inspection of this type?

    ____

21. Are there any follow-up inspection or maintenance actions that you would recommend to your supervisor? ____

22. Is there anything about this task or your performance that you would like me to make note of? ____

23. General Observer Notes:

TASK I POST-EXPERIMENT EVALUATION FORM

1. Team ID: __________
2. Time: __________

3. Did this task do an accurate job of measuring your inspection skills (Inspector #1)?

   1 2 3 4 5 6 7 8 9

   Very Inaccurate — Very Accurate

4. Did this task do an accurate job of measuring your inspection skills (Inspector #2)?

   1 2 3 4 5 6 7 8 9

   Very Inaccurate — Very Accurate

5. How rested are you (Inspector #1)?

   1 2 3 4 5 6 7 8 9

   Very Tired — Very Rested

6. How rested are you (Inspector #2)?

   1 2 3 4 5 6 7 8 9

   Very Tired — Very Rested

7. How well did you understand the instructions you were given?

   1 2 3 4 5 6 7 8 9

   Very Poorly — Very Well

8. How accessible do you feel the various bridge components were?

   1 2 3 4 5 6 7 8 9

   Very Inaccessible — Very Accessible

9. Were there any inaccessible parts of the bridge that you would have liked to inspect, but could not? ______________________________

10. How well do you feel that this bridge has been maintained?

    1 2 3 4 5 6 7 8 9

    Very Poorly — Very Well

11. How complex was this bridge?

    1 2 3 4 5 6 7 8 9

    Very Simple — Very Complex

12. Do you think my presence as an observer had any influence on your inspection?

    1 2 3 4 5 6 7 8 9

    No Influence — Great Influence

13. Did you feel rushed while completing this task (Inspector #1)?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

14. Did you feel rushed while completing this task (Inspector #2)?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

15. What was your effort level on this task in comparison with your normal effort level (Inspector #1)?

1	2	3	4	5	6	7	8	9
Much Lower				Average				Much Greater

16. What was your effort level on this task in comparison with your normal effort level (Inspector #2)?

1	2	3	4	5	6	7	8	9
Much Lower				Average				Much Greater

17. How thorough were you in completing this task in comparison to your normal inspection?

1	2	3	4	5	6	7	8	9
Less Thorough				Average				More Thorough

18. Did you have any specific distractions that adversely affected your inspection (Inspector #1)?

___ Hunger
___ "Nature calls"
___ Access equipment stability
___ Height
___ Temperature
___ Humidity
___ Wind
___ Traffic
___ Noise
___ Other: ______________________

19. Did you have any specific distractions that adversely affected your inspection (Inspector #2)?

___ Hunger
___ "Nature calls"
___ Access equipment stability
___ Height
___ Temperature
___ Humidity
___ Wind
___ Traffic
___ Noise
___ Other: ______________________

20. What other tools would you have normally used during an inspection of this type?
____

21. Are there any follow-up inspection or maintenance actions that you would recommend to your supervisor? ____

22. Is there anything about this task or your performance that you would like me to make note of? ____

23. General Observer Notes:

APPENDIX J. OBSERVER DATA FORMS

TASK A FIRSTHAND OBSERVATION FORM

1. Inspector ID: __________
2. Start Time: __________
3. End Time: __________

4. General weather condition:
   ___ 0-20% Cloudy
   ___ 20-40% Cloudy
   ___ 40-60% Cloudy
   ___ 60-80% Cloudy
   ___ 80-100% Cloudy
   ___ Hazy
   ___ Fog
   ___ Drizzle
   ___ Steady Rain
   ___ Thunderstorm

5. Environmental conditions (5 ft above ground under center of superstructure):
   Temperature (degrees F): ___
   Humidity (%): ___
   Wind speed (mph): ___
   Light intensity (fc): ___
      Note: Light intensity measured at ground level.
   Noise level (dB): ___

6. Environmental conditions (measured on center of deck):
   Light intensity (fc): ___

7. Observer notes:

8. Did the inspector (superstructure):
   ___ Inspect E girder
   ___ Inspect W girder
   ___ Inspect N bearings
   ___ Inspect S bearings
   ___ Inspect floorbeams
   ___ Inspect underside of deck

9. Did the inspector (substructure):
   ___ Inspect N abutment
   ___ Sound N abutment
   ___ Inspect S abutment
   ___ Sound S abutment
   ___ Inspect NW wingwall
   ___ Sound NW wingwall

___ Inspect NE wingwall
___ Sound NE wingwall
___ Inspect SW wingwall
___ Sound SW wingwall
___ Inspect SE wingwall
___ Sound SE wingwall

10. Did the inspector (deck):
    ___ Inspect E girder
    ___ Inspect W girder
    ___ Inspect E curb
    ___ Sound E curb
    ___ Inspect W curb
    ___ Sound W curb
    ___ Inspect curb/web interface E
    ___ Inspect curb/web interface W
    ___ Inspect E girder transverse stiffeners
    ___ Inspect W girder transverse stiffeners
    ___ Inspect N transverse expansion joint
    ___ Inspect S transverse expansion joint
    ___ Check W overall alignment
    ___ Check E overall alignment

11. What tools did the inspector use?
    ___ Masonry Hammer
    ___ Tape Measure
    ___ Engr Scale
    ___ Stepladder
    ___ Extension Ladder
    ___ Small Maglite
    ___ Large Maglite
    ___ Lantern Flashlight
    ___ Level as Level
    ___ Level as Straightedge
    ___ Chain
    ___ Binoculars
    ___ Magnifying Glass
    ___ Protractor
    ___ Plumb Bob
    ___ String
    ___ Clamps

12. Was the inspector focused on the task?

1	2	3	4	5	6	7	8	9
Very Unfocused								Very Focused

13. Did the inspector seem rushed?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

14. General observer notes:

TASK B FIRSTHAND OBSERVATION FORM

1. Inspector ID: __________
2. Start Time: __________
3. End Time: __________

4. General weather condition:
   - ___ 0-20% Cloudy
   - ___ 20-40% Cloudy
   - ___ 40-60% Cloudy
   - ___ 60-80% Cloudy
   - ___ 80-100% Cloudy
   - ___ Hazy
   - ___ Fog
   - ___ Drizzle
   - ___ Steady Rain
   - ___ Thunderstorm

5. Environmental conditions (5 ft above ground under center of superstructure):
   Temperature (degrees F): ___
   Humidity (%): ___
   Wind speed (mph): ___
   Light intensity (fc): ___
   Note: Light intensity measured at ground level.
   Noise level (dB): ___

6. Environmental conditions (measured on center of deck):
   Light intensity (fc): ___

7. Observer notes:

8. Did the inspector (superstructure):
   - ___ Inspect T-beams
   - ___ Sound T-beams
   - ___ Inspect longitudinal expansion joint
   - ___ Inspect underside of deck
   - ___ Sound underside of deck

9. Did the inspector (substructure):
   - ___ Inspect W abutment
   - ___ Sound W abutment
   - ___ Inspect W abutment expansion joint
   - ___ Sound W abutment expansion joint
   - ___ Inspect E abutment
   - ___ Sound E abutment

___ Inspect E abutment expansion joint
___ Sound E abutment expansion joint
___ Inspect NE wingwall
___ Sound NE wingwall
___ Inspect SE wingwall
___ Sound SE wingwall
___ Inspect NW wingwall
___ Sound NW wingwall
___ Inspect SW wingwall
___ Sound SW wingwall
___ Inspect NE wingwall/abutment joint
___ Sound NE wingwall/abutment joint
___ Inspect SE wingwall/abutment joint
___ Sound SE wingwall/abutment joint
___ Inspect NW wingwall/abutment joint
___ Sound NW wingwall/abutment joint
___ Inspect SW wingwall/abutment joint
___ Sound SW wingwall/abutment joint

10. Did the inspector (deck):
___ Inspect N parapet
___ Sound N parapet
___ Inspect S parapet
___ Sound S parapet
___ Inspect wearing surface
___ Inspect W transverse expansion joint
___ Inspect E transverse expansion joint

11. What tools did the inspector use?
___ Masonry Hammer
___ Tape Measure
___ Engr Scale
___ Stepladder
___ Extension Ladder
___ Small Maglite
___ Large Maglite
___ Lantern Flashlight
___ Level as Level
___ Level as Straightedge
___ Chain
___ Binoculars
___ Magnifying Glass
___ Protractor
___ Plumb Bob
___ String
___ Clamps

12. Was the inspector focused on the task?

1	2	3	4	5	6	7	8	9
Very Unfocused								Very Focused

13. Did the inspector seem rushed?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

14. General observer notes:

TASK C FIRSTHAND OBSERVATION FORM

1. Inspector ID: __________
2. Start Time: __________
3. End Time: __________

4. General weather condition:
   ___ 0-20% Cloudy
   ___ 20-40% Cloudy
   ___ 40-60% Cloudy
   ___ 60-80% Cloudy
   ___ 80-100% Cloudy
   ___ Hazy
   ___ Fog
   ___ Drizzle
   ___ Steady Rain
   ___ Thunderstorm

5. Environmental conditions (5 ft above ground under center of superstructure):
   Temperature (degrees F): ___
   Humidity (%): ___
   Wind speed (mph): ___
   Light intensity (fc): ___
      Note: Light intensity measured at ground level.
   Noise level (dB): ___

6. Environmental conditions (measured on center of deck):
   Light intensity (fc): ___

7. Observer notes:

8. Did the inspector (superstructure):
   ___ Inspect T-beams
   ___ Sound T-beams
   ___ Inspect longitudinal expansion joint
   ___ Inspect underside of deck
   ___ Sound underside of deck

9. Did the inspector (substructure):
   ___ Inspect W abutment
   ___ Sound W abutment
   ___ Inspect W abutment expansion joint
   ___ Sound W abutment expansion joint
   ___ Inspect E abutment
   ___ Sound E abutment
   ___ Inspect E abutment expansion joint

___ Sound E abutment expansion joint
___ Inspect NE wingwall
___ Sound NE wingwall
___ Inspect SE wingwall
___ Sound SE wingwall
___ Inspect NW wingwall
___ Sound NW wingwall
___ Inspect SW wingwall
___ Sound SW wingwall
___ Inspect NE wingwall/abutment joint
___ Sound NE wingwall/abutment joint
___ Inspect SE wingwall/abutment joint
___ Sound SE wingwall/abutment joint
___ Inspect NW wingwall/abutment joint
___ Sound NW wingwall/abutment joint
___ Inspect SW wingwall/abutment joint
___ Sound SW wingwall/abutment joint

10. Did the inspector (deck):
___ Inspect N parapet
___ Sound N parapet
___ Inspect S parapet
___ Sound S parapet
___ Inspect wearing surface
___ Inspect W transverse expansion joint
___ Inspect E transverse expansion joint

11. What tools did the inspector use?
___ Masonry Hammer
___ Tape Measure
___ Engr Scale
___ Stepladder
___ Extension Ladder
___ Small Maglite
___ Large Maglite
___ Lantern Flashlight
___ Level as Level
___ Level as Straightedge
___ Chain
___ Binoculars
___ Magnifying Glass
___ Protractor
___ Plumb Bob
___ String
___ Clamps

12. Was the inspector focused on the task?

1	2	3	4	5	6	7	8	9
Very Unfocused								Very Focused

13. Did the inspector seem rushed?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

14. General observer notes:

TASK D FIRSTHAND OBSERVATION FORM

1. Inspector ID: __________
2. Start Time: __________
3. End Time: __________

4. General weather condition:
   ___ 0-20% Cloudy
   ___ 20-40% Cloudy
   ___ 40-60% Cloudy
   ___ 60-80% Cloudy
   ___ 80-100% Cloudy
   ___ Hazy
   ___ Fog
   ___ Drizzle
   ___ Steady Rain
   ___ Thunderstorm

5. Environmental conditions (5 ft above ground under center of superstructure):
   Temperature (degrees F): ___
   Humidity (%): ___
   Wind speed (mph): ___
   Light intensity (fc): ___
   Note: Light intensity measured at ground level.
   Noise level (dB): ___

6. Environmental conditions (measured on center of deck):
   Light intensity (fc): ___

7. Observer notes:

8. Did the inspector (superstructure):
   ___ Inspect arch for cracks
   ___ Inspect longitudinal expansion joint
   ___ Inspect N elevation above arch
   ___ Inspect S elevation above arch

9. Did the inspector (substructure):
   ___ Inspect W abutment
   ___ Sound W abutment
   ___ Inspect E abutment
   ___ Sound E abutment
   ___ Inspect SW wingwall
   ___ Sound SW wingwall
   ___ Inspect SE wingwall
   ___ Sound SE wingwall

___ Inspect NW wingwall
___ Sound NW wingwall
___ Inspect NE wingwall
___ Sound NE wingwall

10. Did the inspector (deck):
    ___ Inspect N parapet
    ___ Sound N parapet
    ___ Inspect S parapet
    ___ Sound S parapet
    ___ Inspect wearing surface
    ___ Inspect W transverse expansion joint
    ___ Inspect E transverse expansion joint

11. What tools did the inspector use?
    ___ Masonry Hammer
    ___ Tape Measure
    ___ Engr Scale
    ___ Stepladder
    ___ Extension Ladder
    ___ Small Maglite
    ___ Large Maglite
    ___ Lantern Flashlight
    ___ Level as Level
    ___ Level as Straightedge
    ___ Chain
    ___ Binoculars
    ___ Magnifying Glass
    ___ Protractor
    ___ Plumb Bob
    ___ String
    ___ Clamps

12. Was the inspector focused on the task?

1	2	3	4	5	6	7	8	9
Very Unfocused								Very Focused

13. Did the inspector seem rushed?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

14. General observer notes:

TASK E FIRSTHAND OBSERVATION FORM

1. Inspector ID: __________
2. Start Time: __________
3. End Time: __________

4. General weather condition:
   - ___ 0-20% Cloudy
   - ___ 20-40% Cloudy
   - ___ 40-60% Cloudy
   - ___ 60-80% Cloudy
   - ___ 80-100% Cloudy
   - ___ Hazy
   - ___ Fog
   - ___ Drizzle
   - ___ Steady Rain
   - ___ Thunderstorm

5. Environmental conditions (5 ft above ground at center of west base of abutment):
   Temperature (degrees F): ___
   Humidity (%): ___
   Wind speed (mph): ___
   Light intensity (fc): ___
   Note: Light intensity measured at ground level.
   Noise level (dB): ___

6. Environmental conditions (measured on center of deck):
   Light intensity (fc): ___

7. Observer notes:

8. Did the inspector (superstructure):
   - ___ Inspect superstructure with binoculars
   - ___ Inspect bearings (elevated)
   - ___ Check bearing rotations (elevated)

9. Did the inspector (substructure):
   - ___ Inspect E abutment
   - ___ Sound E abutment
   - ___ Inspect W abutment
   - ___ Sound W abutment
   - ___ Inspect NE wingwall
   - ___ Sound NE wingwall
   - ___ Inspect NW wingwall
   - ___ Sound NW wingwall
   - ___ Inspect SE wingwall

___ Sound SE wingwall
___ Inspect SW wingwall
___ Sound SW wingwall

10. Did the inspector (deck):
    ___ Inspect longitudinal joint
    ___ Inspect E expansion joint
    ___ Inspect W expansion joint
    ___ Inspect N parapet
    ___ Sound N parapet
    ___ Inspect S parapet
    ___ Sound S parapet
    ___ Inspect deck surface
    ___ Check W alignment
    ___ Check E alignment

11. What tools did the inspector use?
    ___ Masonry Hammer
    ___ Tape Measure
    ___ Engr Scale
    ___ Stepladder
    ___ Extension Ladder
    ___ Small Maglite
    ___ Large Maglite
    ___ Lantern Flashlight
    ___ Level as Level
    ___ Level as Straightedge
    ___ Chain
    ___ Binoculars
    ___ Magnifying Glass
    ___ Protractor
    ___ Plumb Bob
    ___ String
    ___ Clamps

12. Was the inspector focused on the task?

1	2	3	4	5	6	7	8	9
Very Unfocused								Very Focused

13. Did the inspector seem rushed?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

14. General observer notes:

TASK F FIRSTHAND OBSERVATION FORM

1. Inspector ID: __________
2. Start Time: __________
3. End Time: __________

4. General weather condition:
   ___ 0-20% Cloudy
   ___ 20-40% Cloudy
   ___ 40-60% Cloudy
   ___ 60-80% Cloudy
   ___ 80-100% Cloudy
   ___ Hazy
   ___ Fog
   ___ Drizzle
   ___ Steady Rain
   ___ Thunderstorm

5. Environmental condition (elevated near SW superstructure):
   Temperature (degrees F): ___
   Humidity (%): ___
   Wind speed (mph): ___
   Light intensity (fc): ___
   Note: Measured at web/flange/stiffener connection on interior of exterior girder.
   Noise level (dB): ___

6. Observer notes:

7. Did the inspector (from lift):
   ___ Inspect behind end diaphragm
   ___ Inspect outer bearing
   ___ Inspect middle bearing
   ___ Inspect inner bearing
   ___ Inspect end diaphragm connections
   ___ Inspect intermediate diaphragm-web connections
   ___ Inspect sway frame-web connections
   ___ Inspect bottom flange rivets
   ___ Inspect fascia girder
   ___ Inspect middle girder
   ___ Inspect inner girder

8. Did the inspector (from ladder):
   ___ Inspect behind end diaphragm
   ___ Inspect outer bearing
   ___ Inspect middle bearing
   ___ Inspect inner bearing

___ Inspect end diaphragm connections
___ Inspect intermediate diaphragm-web connections
___ Inspect sway frame-web connections (from ladder)
___ Inspect bottom flange rivets
___ Inspect fascia girder
___ Inspect middle girder
___ Inspect inner girder

9. What tools did the inspector use?
___ Masonry Hammer
___ Tape Measure
___ Engr Scale
___ Stepladder
___ Extension Ladder
___ Small Maglite
___ Large Maglite
___ Lantern Flashlight
___ Level as Level
___ Level as Straightedge
___ Chain
___ Binoculars
___ Magnifying Glass
___ Protractor
___ Plumb Bob
___ String
___ Clamps

10. Was the inspector focused on the task?
1 2 3 4 5 6 7 8 9
Very Unfocused Very Focused

11. Did the inspector seem rushed?
1 2 3 4 5 6 7 8 9
Not Rushed Very Rushed

12. How comfortable was the inspector with the working height?
1 2 3 4 5 6 7 8 9
Very Uncomfortable Very Comfortable

13. How comfortable was the inspector with the lift?
1 2 3 4 5 6 7 8 9
Very Uncomfortable Very Comfortable

14. Quality of boom lift operation?

1	2	3	4	5
Poor		Average		Stellar

15. General observer notes:

TASK G FIRSTHAND OBSERVATION FORM

1. Inspector ID: __________
2. Start Time: __________
3. End Time: __________

4. General weather condition:
    ___ 0-20% Cloudy
    ___ 20-40% Cloudy
    ___ 40-60% Cloudy
    ___ 60-80% Cloudy
    ___ 80-100% Cloudy
    ___ Hazy
    ___ Fog
    ___ Drizzle
    ___ Steady Rain
    ___ Thunderstorm

5. Environmental conditions (5 ft above ground level; center of in-depth span):
    Temperature (degrees F): ___
    Humidity (%): ___
    Wind speed (mph): ___
    Light intensity (fc): ___
        Note: Light intensity measured at ground level.
    Noise level (dB): ___

6. Environmental conditions (measured on web of interior girder at south abutment):
        Note: Only measure if inspector climbs south abutment.
    Light intensity (fc): ___

7. Observer notes:

8. Did the inspector (superstructure):
    ___ Inspect Span 5 with binoculars
    ___ Inspect Span 6 with binoculars
    ___ Inspect Span 7 with binoculars
    ___ Inspect Span 8 with binoculars
    ___ Inspect Pier 4 bearing
    ___ Inspect Pier 5 bearing
    ___ Inspect Pier 6 bearing
    ___ Inspect Pier 7 bearing

9. Did the inspector (substructure):
    ___ Inspect Pier 4
    ___ River low enough to sound
    ___ Sound Pier 4

___ Inspect Pier 5
___ Sound Pier 5
___ Inspect Pier 6
___ Sound Pier 6
___ Inspect Pier 7
___ Sound Pier 7
___ Climb up to S abutment
___ Sound abutment seat
___ Sound abutment backwall

10. Did the inspector (deck):
    ___ Inspect S expansion joint from below
    ___ Inspect S expansion joint from above
    ___ Check W alignment

11. What tools did the inspector use?
    ___ Masonry Hammer
    ___ Tape Measure
    ___ Engr Scale
    ___ Stepladder
    ___ Extension Ladder
    ___ Small Maglite
    ___ Large Maglite
    ___ Lantern Flashlight
    ___ Level as Level
    ___ Level as Straightedge
    ___ Chain
    ___ Binoculars
    ___ Magnifying Glass
    ___ Protractor
    ___ Plumb Bob
    ___ String
    ___ Clamps

12. Was the inspector focused on the task?

1	2	3	4	5	6	7	8	9
Very Unfocused								Very Focused

13. Did the inspector seem rushed?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

14. General observer notes:

TASK H FIRSTHAND OBSERVATION FORM

1. Inspector ID: __________
2. Start Time: __________
3. End Time: __________

4. General weather condition:
   ___ 0-20% Cloudy
   ___ 20-40% Cloudy
   ___ 40-60% Cloudy
   ___ 60-80% Cloudy
   ___ 80-100% Cloudy
   ___ Hazy
   ___ Fog
   ___ Drizzle
   ___ Steady Rain
   ___ Thunderstorm

5. Environmental conditions (measured elevated near mid-span):
   Temperature (degrees F): ___
   Humidity (%): ___
   Wind speed (mph): ___
   Light intensity (fc): ___
   Note: Measured at web/bottom flange/stiffener interface on interior of exterior girder.
   Noise level (dB): ___

6. Observer notes:

7. Inspection checklist:
   ___ Inspect N flange transitions
   ___ Inspect S flange transitions
   ___ Inspect N Girder 3 splice plates
   ___ Inspect N Girder 4 splice plates
   ___ Inspect S Girder 3 splice plates
   ___ Inspect S Girder 4 splice plates
   ___ Inspect Girder 4 stiffener retrofits
   ___ Inspect <25% of utility welds
   ___ Inspect 25-75% of utility welds
   ___ Inspect >75% of utility welds
   ___ Inspect a few drain tack welds
   ___ Inspect most drain tack welds
   ___ Inspect <25% of lateral connection gusset plate welds
   ___ Inspect 25-75% of lateral connection gusset plate welds
   ___ Inspect >75% of lateral connection gusset plate welds
   ___ Inspect stiffener-to-web connection (bottom near mid-span)
   ___ Inspect stiffener-to-web connection (top near pier)

8. Sounding checklist:
   ___ Sound 1-3 bolts per splice
   ___ Sound 4-10 bolts per splice
   ___ Sound 10+ bolts per splice
   ___ Sound a few lateral connection bolts
   ___ Sound bolts on more than half of the lateral connections

9. What tools did the inspector use?
   ___ Masonry Hammer
   ___ Tape Measure
   ___ Engr Scale
   ___ Stepladder
   ___ Extension Ladder
   ___ Small Maglite
   ___ Large Maglite
   ___ Lantern Flashlight
   ___ Level as Level
   ___ Level as Straightedge
   ___ Chain
   ___ Binoculars
   ___ Magnifying Glass
   ___ Protractor
   ___ Plumb Bob
   ___ String
   ___ Clamps

10. Was the inspector focused on the task?

1	2	3	4	5	6	7	8	9
Very Unfocused								Very Focused

11. Did the inspector seem rushed?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

12. In general, approximately how close did the inspector get to the welds?
(Note: Record amount in inches.) ____________

13. Was the inspector's viewing angle varied while inspecting the welds?

1	2	3	4	5	6	7	8	9
Never								Always

14. How comfortable was the inspector with the working height?

1	2	3	4	5	6	7	8	9
Not Comfortable								Very Comfortable

15. How comfortable was the inspector with the lift?

1	2	3	4	5	6	7	8	9
Not Comfortable							Very Comfortable	

16. Quality of boom lift operation?

1	2	3	4	5
Poor		Average		Stellar

17. General observer notes:

TASK I FIRSTHAND OBSERVATION FORM

1. Team ID: __________
2. Start Time: __________
3. End Time: __________

4. General weather condition:
   - ___ 0-20% Cloudy
   - ___ 20-40% Cloudy
   - ___ 40-60% Cloudy
   - ___ 60-80% Cloudy
   - ___ 80-100% Cloudy
   - ___ Hazy
   - ___ Fog
   - ___ Drizzle
   - ___ Steady Rain
   - ___ Thunderstorm

5. Environmental conditions (measured under south end of superstructure):
   Temperature (degrees F): ___
   Humidity (%): ___
   Wind speed (mph): ___
   Light intensity (fc): ___
   Note: Measured at web/bottom flange/diaphragm interface inside west exterior girder.
   Noise level (dB): ___

6. Environmental conditions (measured on center of deck of center span):
   Light intensity (fc): ___

7. General observer notes:

8. Observer notes for Inspector #1:

9. Observer notes for Inspector #2:

10. Did the team (superstructure):
    - ___ Check S bearing location
    - ___ Check S bearing rotation
    - ___ Check middle bearing location
    - ___ Check middle bearing rotation
    - ___ Check N bearing location
    - ___ Check N bearing rotation
    - ___ Inspect coverplate terminations S span
    - ___ Inspect coverplate terminations middle span
    - ___ Check for missing/loose bolts S span
    - ___ Check for missing/loose bolts middle span

___ Inspect diaphragm/web weld connection S span
___ Inspect diaphragm/web weld connection middle span
___ Inspect underside of deck S span
___ Inspect underside of deck middle span

11. Did the team (substructure):
    ___ Inspect S pier cap
    ___ Sound S pier cap
    ___ Inspect N pier cap
    ___ Sound N pier cap
    ___ Inspect S pier columns
    ___ Sound S pier columns
    ___ Inspect N pier columns
    ___ Sound N pier columns
    ___ Inspect S abutment
    ___ Sound S abutment

12. Did the team (deck):
    ___ Sound deck (masonry hammer)
    ___ Drag deck (partial)
    ___ Drag deck (in-depth)
    ___ Sound W parapet
    ___ Sound E parapet
    ___ Inspect S expansion joint
    ___ Inspect middle deck joint
    ___ Inspect N deck joint
    ___ Check W overall alignment
    ___ Check E overall alignment

13. What tools did the team use?
    ___ Masonry Hammer
    ___ Tape Measure
    ___ Engr Scale
    ___ Stepladder
    ___ Extension Ladder
    ___ Small Maglite
    ___ Large Maglite
    ___ Lantern Flashlight
    ___ Level as Level
    ___ Level as Straightedge
    ___ Chain
    ___ Binoculars
    ___ Magnifying Glass
    ___ Protractor
    ___ Plumb Bob
    ___ String

___ Clamps

14. Was the team focused on the task?

1	2	3	4	5	6	7	8	9
Very Unfocused								Very Focused

15. Did the team seem rushed?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

16. General observer notes:

TASK J FIRSTHAND OBSERVATION FORM

1. Team ID: __________
2. Start Time: __________
3. End Time: __________

4. General weather condition:
   - ___ 0-20% Cloudy
   - ___ 20-40% Cloudy
   - ___ 40-60% Cloudy
   - ___ 60-80% Cloudy
   - ___ 80-100% Cloudy
   - ___ Hazy
   - ___ Fog
   - ___ Drizzle
   - ___ Steady Rain
   - ___ Thunderstorm

5. Environmental conditions (measured 5 ft above deck at center of center span):
   - Temperature (degrees F): ___
   - Humidity (%): ___
   - Wind speed (mph): ___
   - Light intensity (fc): ___
     - Note: Light intensity measured at ground level.
   - Noise level (dB): ___

6. General observer notes:

7. Observer notes for Inspector #1:

8. Observer notes for Inspector #2:

9. Did the team:
   - ___ Chain drag the deck
   - ___ Selectively use the masonry hammer
   - ___ Focus on areas for detailed mapping

10. What tools did the team use?
    - ___ Masonry Hammer
    - ___ Tape Measure
    - ___ Engr Scale
    - ___ Stepladder
    - ___ Extension Ladder
    - ___ Small Maglite
    - ___ Large Maglite
    - ___ Lantern Flashlight

___ Level as Level
___ Level as Straightedge
___ Chain
___ Binoculars
___ Magnifying Glass
___ Protractor
___ Plumb Bob
___ String
___ Clamps

11. Was the team focused on the task?

1	2	3	4	5	6	7	8	9
Very Unfocused								Very Focused

12. Did the team seem rushed?

1	2	3	4	5	6	7	8	9
Not Rushed								Very Rushed

13. General observer notes:

APPENDIX K. FIELD INSPECTION NOTEBOOK

Visual Inspection Study

Inspector Field Notes

Inspector ID Number: _______

Federal Highway Administration
U.S. Department of Transportation

Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101

WJE

Wiss, Janney, Elstner Associates, Inc.
Engineers, Architects, Material Scientists

225 Peachtree Street, N.E., Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 fax: (404) 577-0066

Task A

Task A

Task A

Task A

Task A

Task A

Task A

Task A

Inspector ID:

Date:

Structure Type:

TASK A
Bridge B521

OVERALL DECK CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ____________________

Deck Elements	Rating											Remarks
Wearing Surface	N	9	8	7	6	5	4	3	2	1	0	
Deck – Topside	N	9	8	7	6	5	4	3	2	1	0	
Deck – Underside	N	9	8	7	6	5	4	3	2	1	0	
SIP Forms	N	9	8	7	6	5	4	3	2	1	0	
Curbs	N	9	8	7	6	5	4	3	2	1	0	
Medians	N	9	8	7	6	5	4	3	2	1	0	
Sidewalks	N	9	8	7	6	5	4	3	2	1	0	
Parapets	N	9	8	7	6	5	4	3	2	1	0	
Railing	N	9	8	7	6	5	4	3	2	1	0	
Expansion Joints	N	9	8	7	6	5	4	3	2	1	0	
Drainage System	N	9	8	7	6	5	4	3	2	1	0	
Lighting	N	9	8	7	6	5	4	3	2	1	0	
Utilities	N	9	8	7	6	5	4	3	2	1	0	
________	N	9	8	7	6	5	4	3	2	1	0	
________	N	9	8	7	6	5	4	3	2	1	0	

Notes: ____________________

Inspector ID:

Date:

TASK A
Bridge B521

OVERALL SUPERSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ______

Superstructure Elements	Rating											Remarks
Stringers	N	9	8	7	6	5	4	3	2	1	0	
Floorbeams	N	9	8	7	6	5	4	3	2	1	0	
Floor System Bracing	N	9	8	7	6	5	4	3	2	1	0	
Multibeams	N	9	8	7	6	5	4	3	2	1	0	
Girders	N	9	8	7	6	5	4	3	2	1	0	
Arches	N	9	8	7	6	5	4	3	2	1	0	
Cables	N	9	8	7	6	5	4	3	2	1	0	
Paint	N	9	8	7	6	5	4	3	2	1	0	
Bearing Devices	N	9	8	7	6	5	4	3	2	1	0	
Connections	N	9	8	7	6	5	4	3	2	1	0	
Welds	N	9	8	7	6	5	4	3	2	1	0	
	N	9	8	7	6	5	4	3	2	1	0	
	N	9	8	7	6	5	4	3	2	1	0	

Timber Decay ______

Concrete Deterioration ______

Steel Corrosion ______

Collision Damage ______

LL Deflection ______

Vibration ______

Member Alignment ______

Utilities ______

Notes: ______

Inspector ID:

Date:

TASK A
Bridge B521

OVERALL SUBSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ______________________________

Substructure Elements	Rating	Remarks
Abutments	N 9 8 7 6 5 4 3 2 1 0	______
Piles	N 9 8 7 6 5 4 3 2 1 0	______
Footing	N 9 8 7 6 5 4 3 2 1 0	______
Stem	N 9 8 7 6 5 4 3 2 1 0	______
Bearing Seat	N 9 8 7 6 5 4 3 2 1 0	______
Backwall	N 9 8 7 6 5 4 3 2 1 0	______
Wingwalls	N 9 8 7 6 5 4 3 2 1 0	______
Piers and Bents	N 9 8 7 6 5 4 3 2 1 0	______
Piles	N 9 8 7 6 5 4 3 2 1 0	______
Footing	N 9 8 7 6 5 4 3 2 1 0	______
Columns/Stem	N 9 8 7 6 5 4 3 2 1 0	______
Cap	N 9 8 7 6 5 4 3 2 1 0	______
______	N 9 8 7 6 5 4 3 2 1 0	______
______	N 9 8 7 6 5 4 3 2 1 0	______

Scour/Undermining ______

Settlement ______

Substructure Protection ______

Collision Damage ______

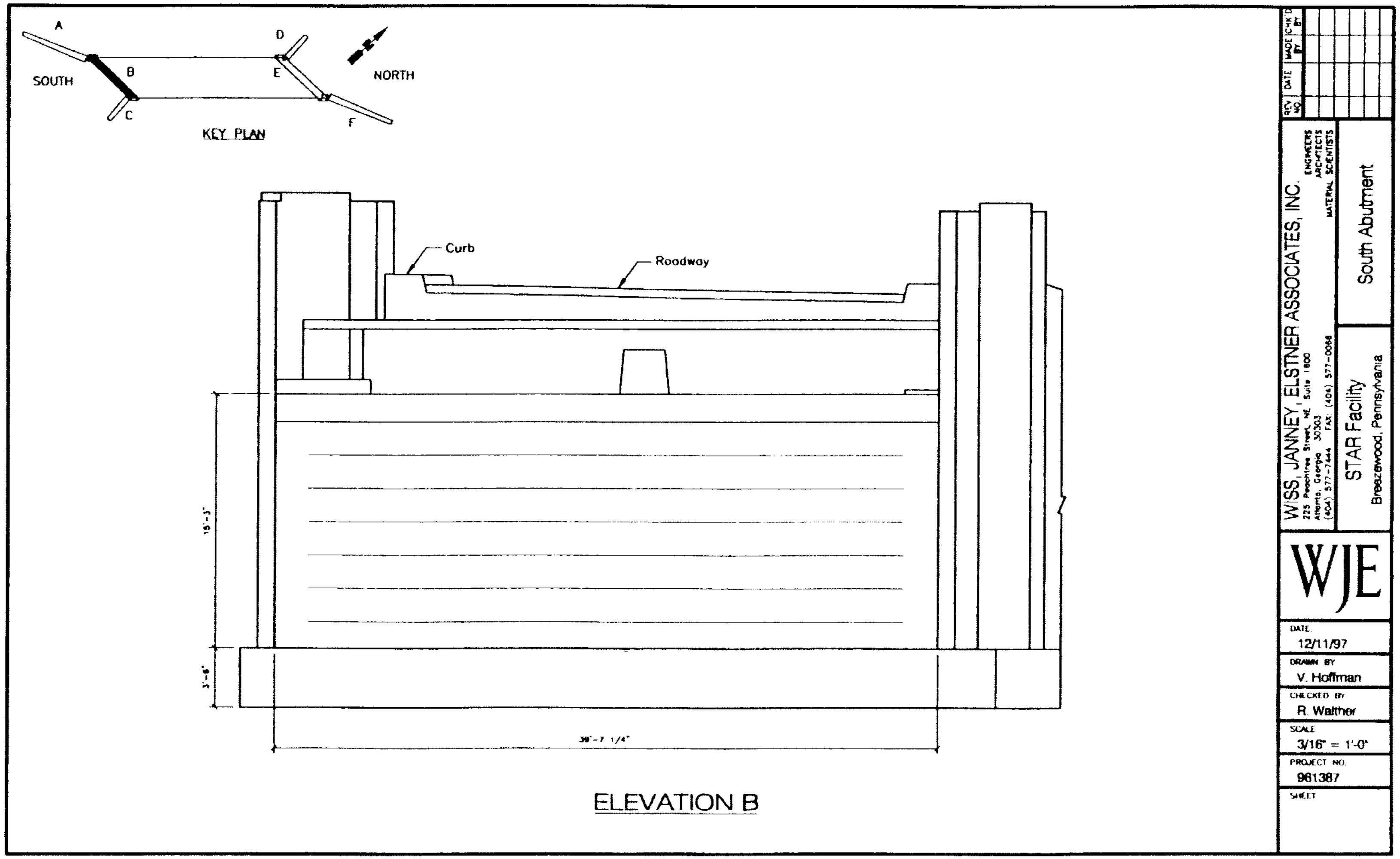
High-water Mark ______

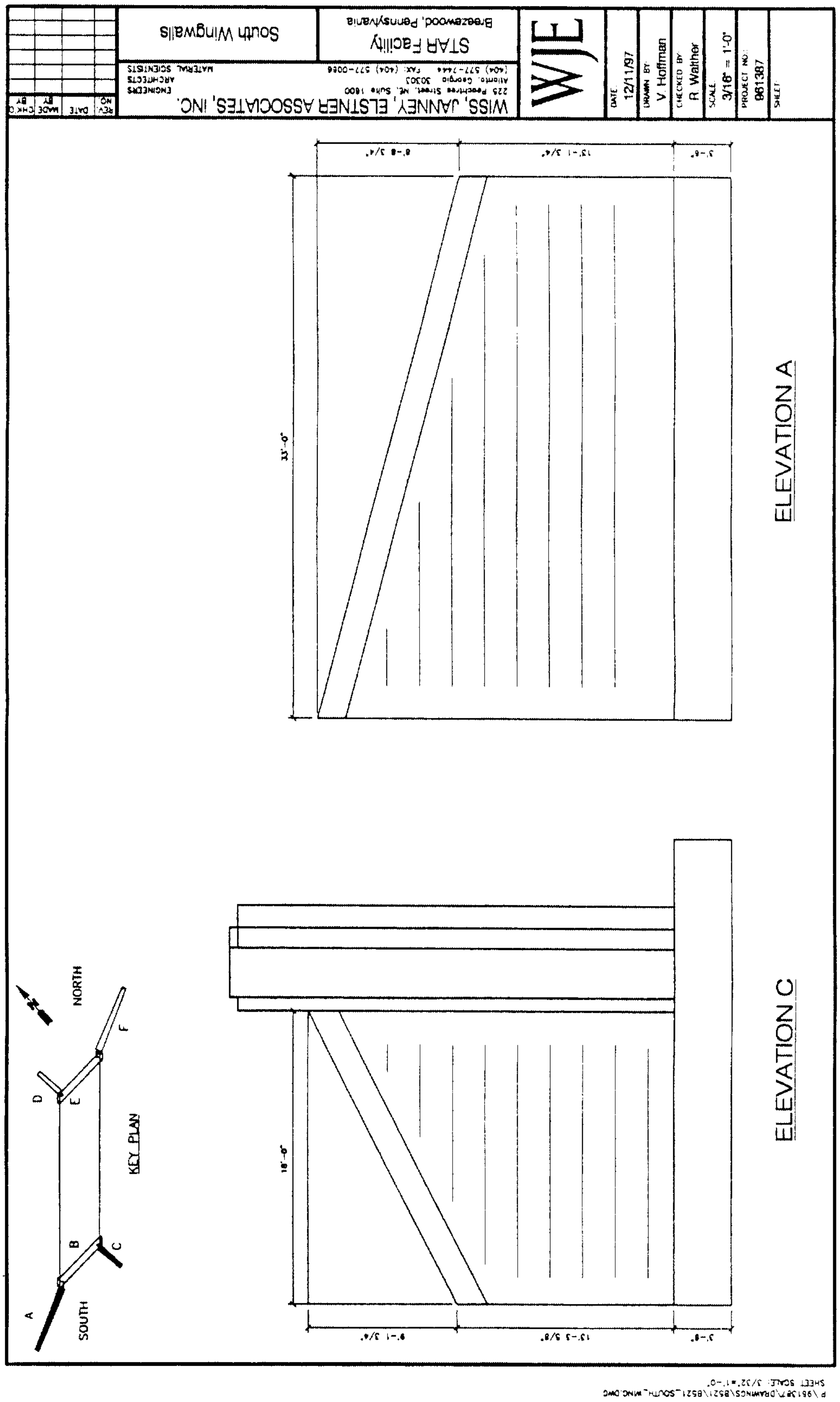
Concrete Deterioration ______

Steel Corrosion ______

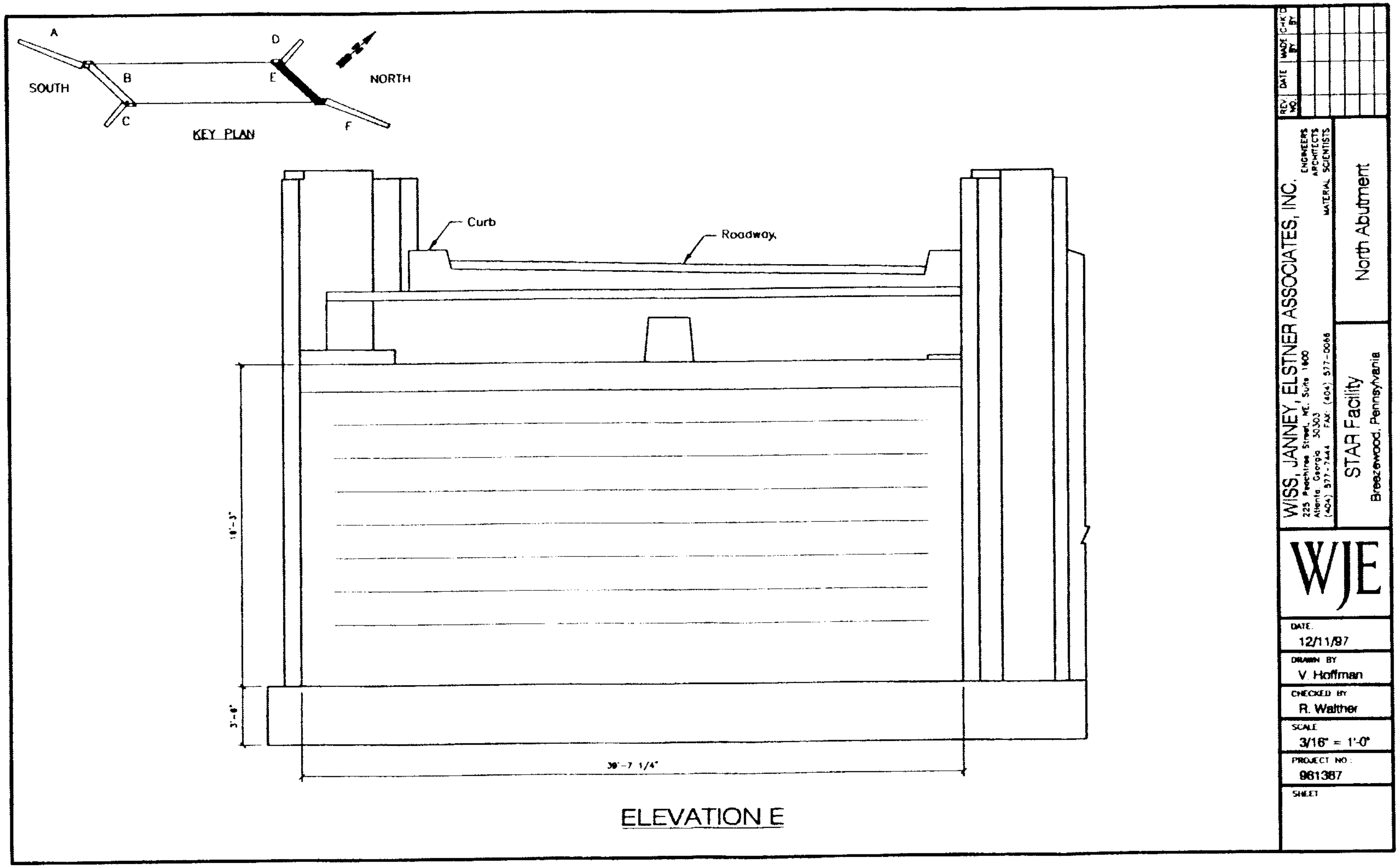
Paint ______

Notes: ______________________________

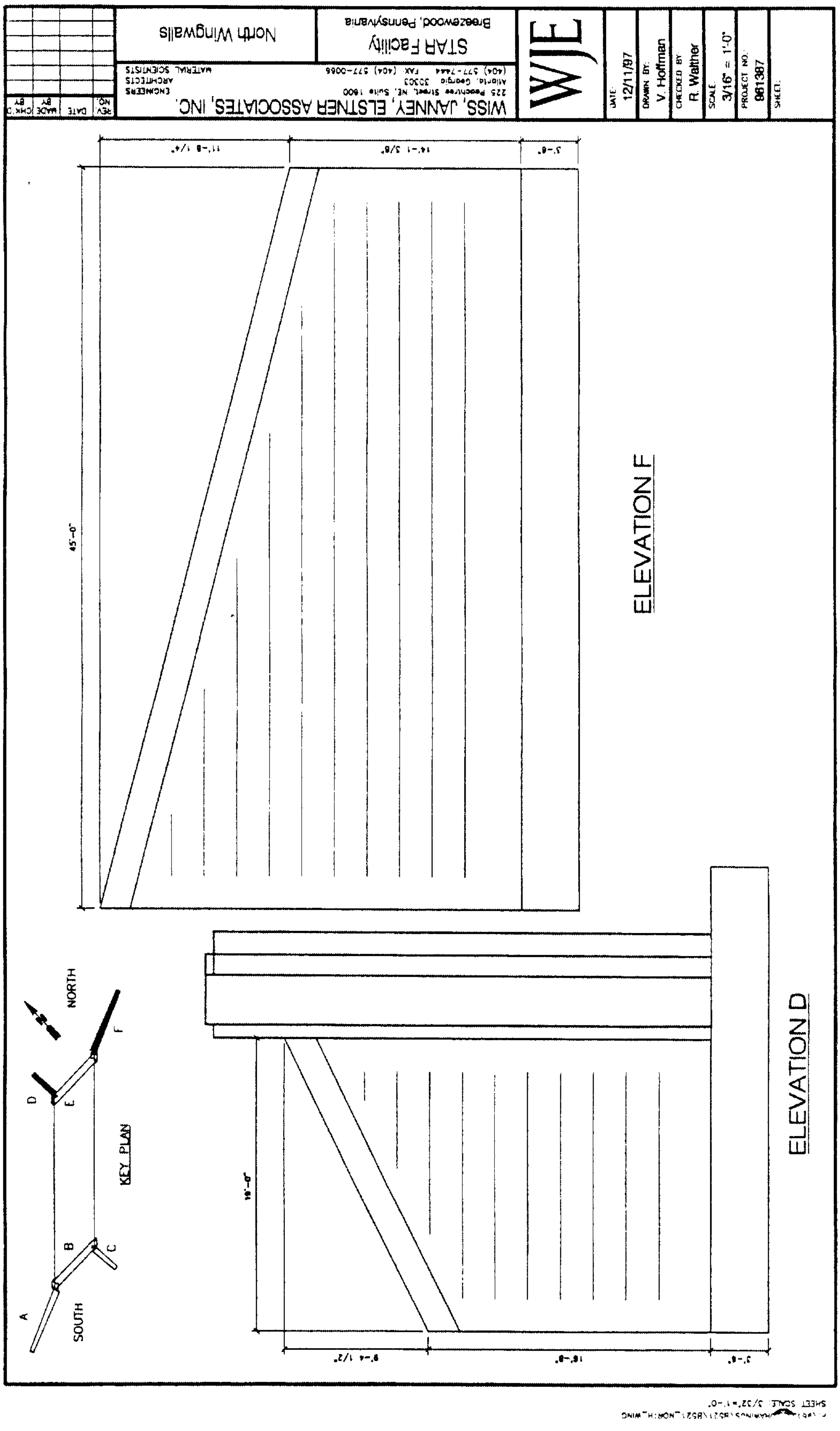

SOUTH
A
B
C
D
E
F
NORTH
KEY PLAN
Curb
Roodway
15'-3"
3'-6"
38'-7 1/4"
ELEVATION B
WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE Suite 1800
Atlanta, Georgia 30303
(404) 577-7444 FAX (404) 577-0068
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
South Abutment
STAR Facility
Breezewood, Pennsylvania
WJE
DATE
12/11/97
DRAWN BY
V. Hoffman
CHECKED BY
R. Walther
SCALE
3/16" = 1'-0"
PROJECT NO.
981387
SHEET
REV NO.
DATE
MADE BY
CHK'D BY



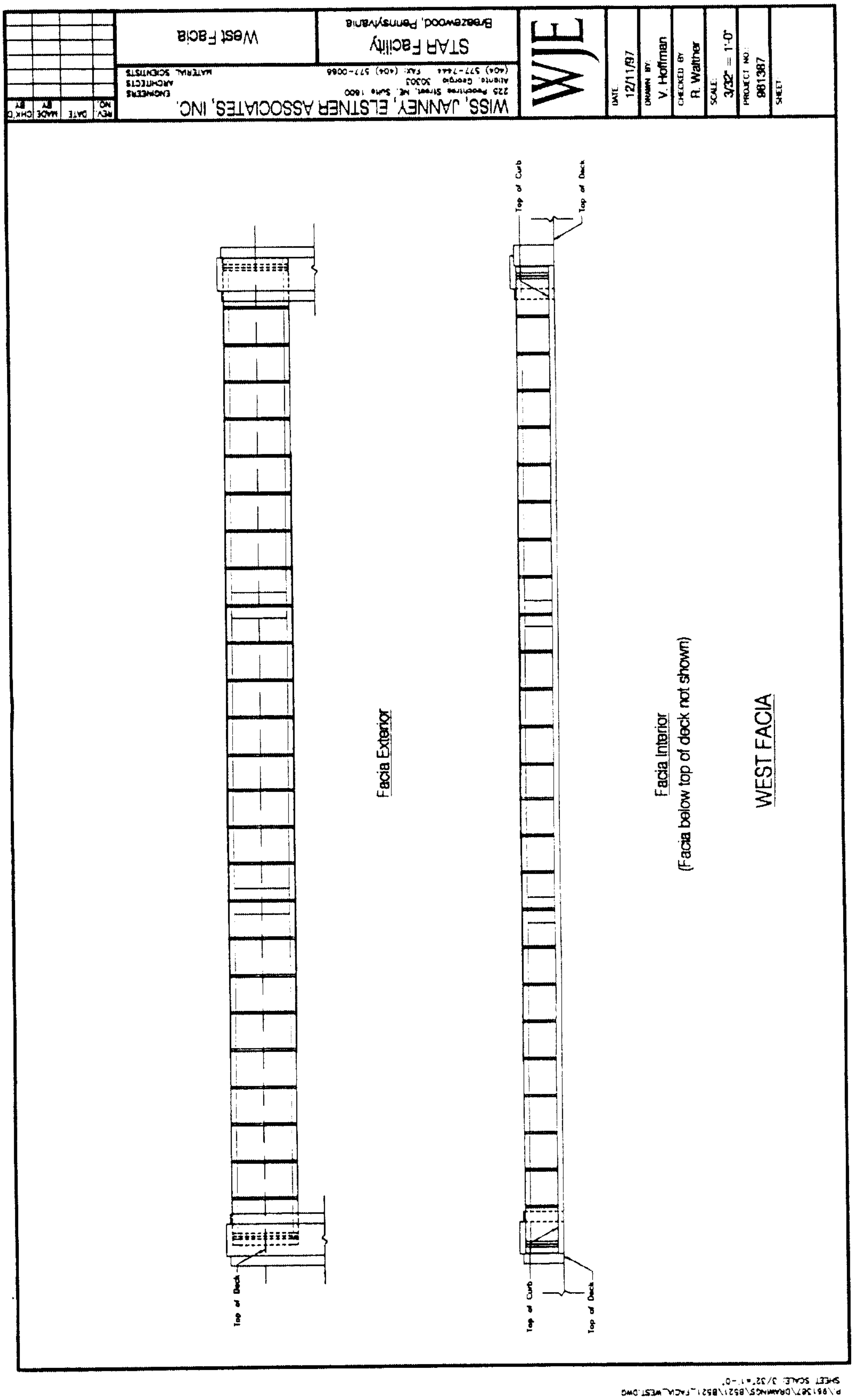
WISS, JANNEY, ELSTNER ASSOCIATES, INC.
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
South Wingwalls
WJE
DATE 12/11/97
DRAWN BY V. Hoffman
CHECKED BY R. Walther
SCALE 3/16" = 1'-0"
PROJECT NO. 961387
SHEET
ELEVATION A
ELEVATION C
KEY PLAN
NORTH
SOUTH
A
B
C
D
E
F
33'-0"
18'-0"
8'-8 3/4"
13'-1 3/4"
3'-6"
9'-1 3/4"
13'-3 5/8"

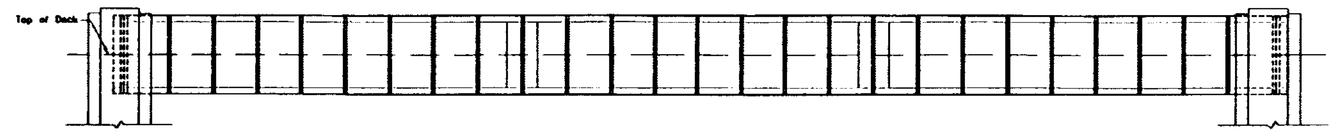


P:\981387\DRAWINGS\B521\B521_NORTH_ABUT.DWG
SHEET SCALE: 3/32"=1'-0"

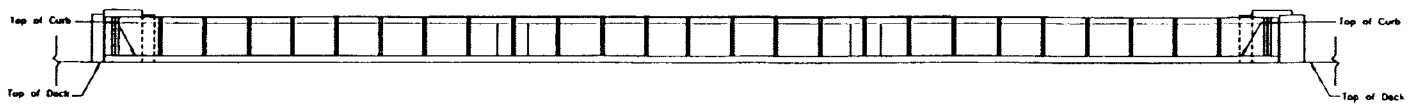


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
STAR Facility
Breezewood, Pennsylvania
North Wingwalls
WJE
12/11/97
V. Hoffman
R. Walther
3/16" = 1'-0"
961387
ELEVATION F
ELEVATION D
KEY PLAN
NORTH
SOUTH


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX: (404) 577-0066
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
West Facia
WJE
DATE 12/11/97
DRAWN BY V. Hoffman
CHECKED BY R. Walther
SCALE 3/32" = 1'-0"
PROJECT NO. 981387
SHEET
REV. NO.
DATE
MADE BY
CHK'D BY
Top of Deck
Facia Exterior
Top of Curb
Top of Deck
Facia Interior
(Facia below top of deck not shown)
WEST FACIA
P:\981387\DRAWINGS\B521\B521_FACIA_WEST.DWG
SHEET SCALE: 3/32"=1'-0"



Facia Exterior



Facia Interior
(Facia below top of deck not shown)

EAST FACIA

REV. NO.	DATE	MADE BY	CHK'D BY

WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1800
Atlanta, Georgia 30303
(404) 577-7444 FAX: (404) 577-0086
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS

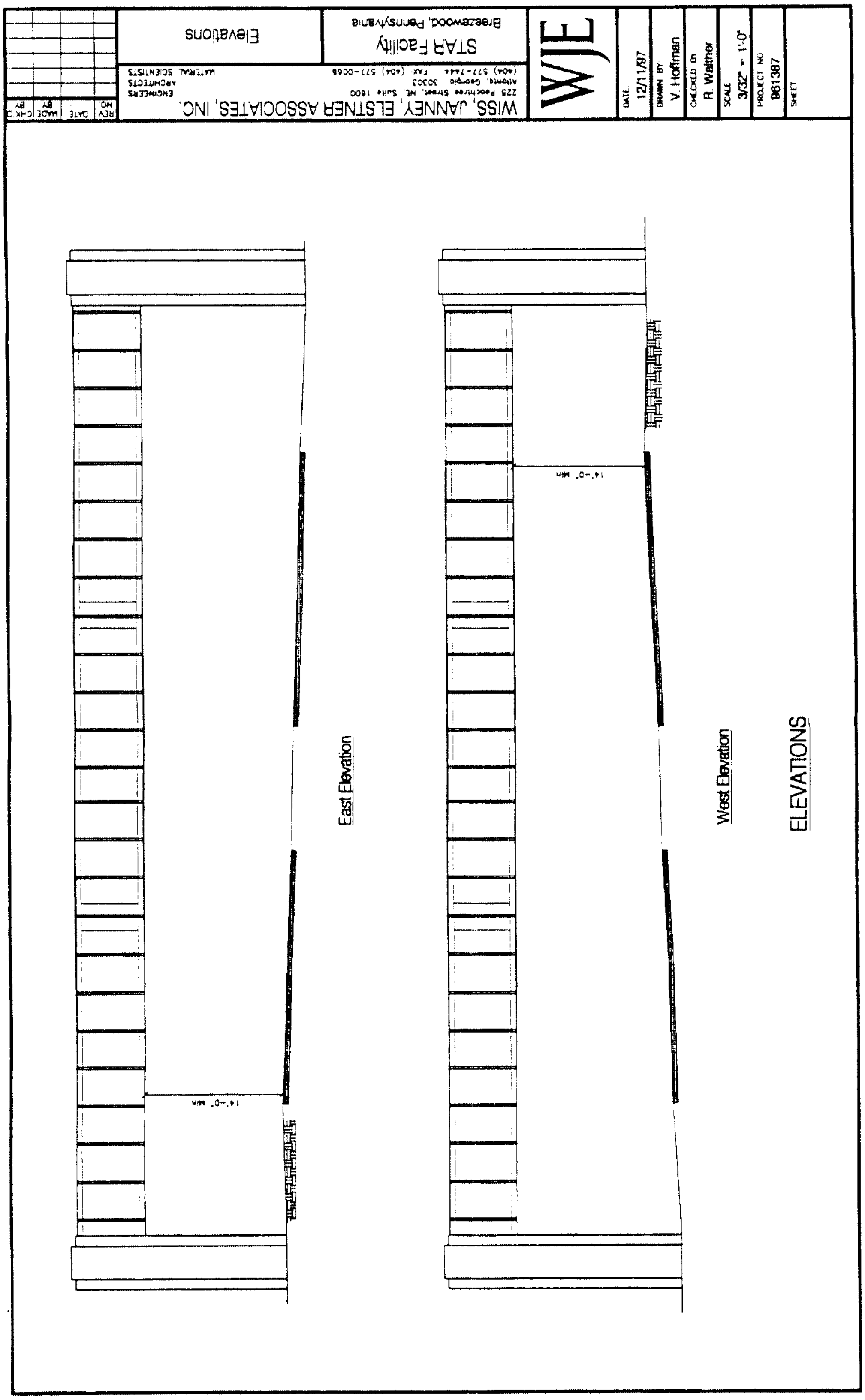
East Facia

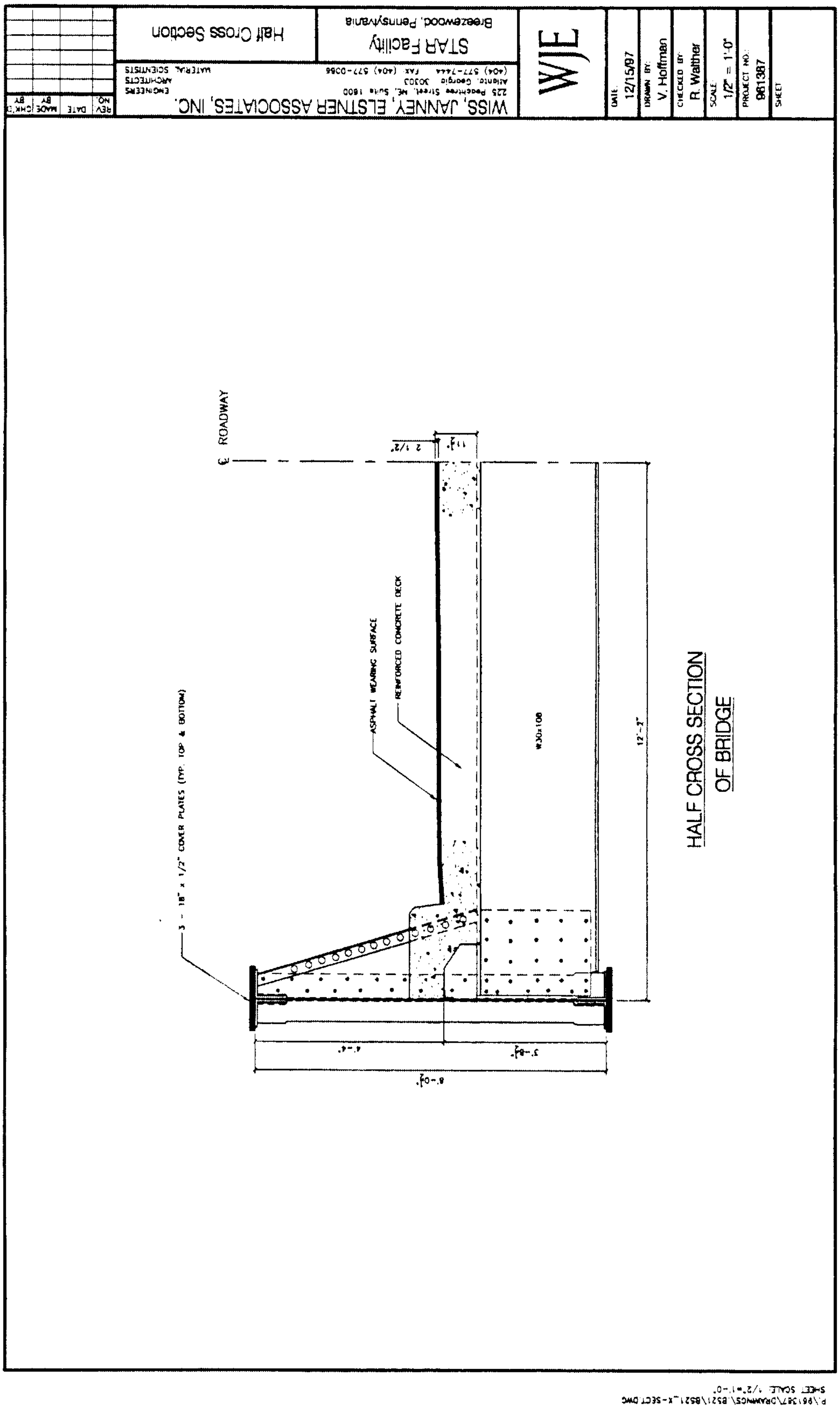
STAR Facility
Breezewood, Pennsylvania

WJE

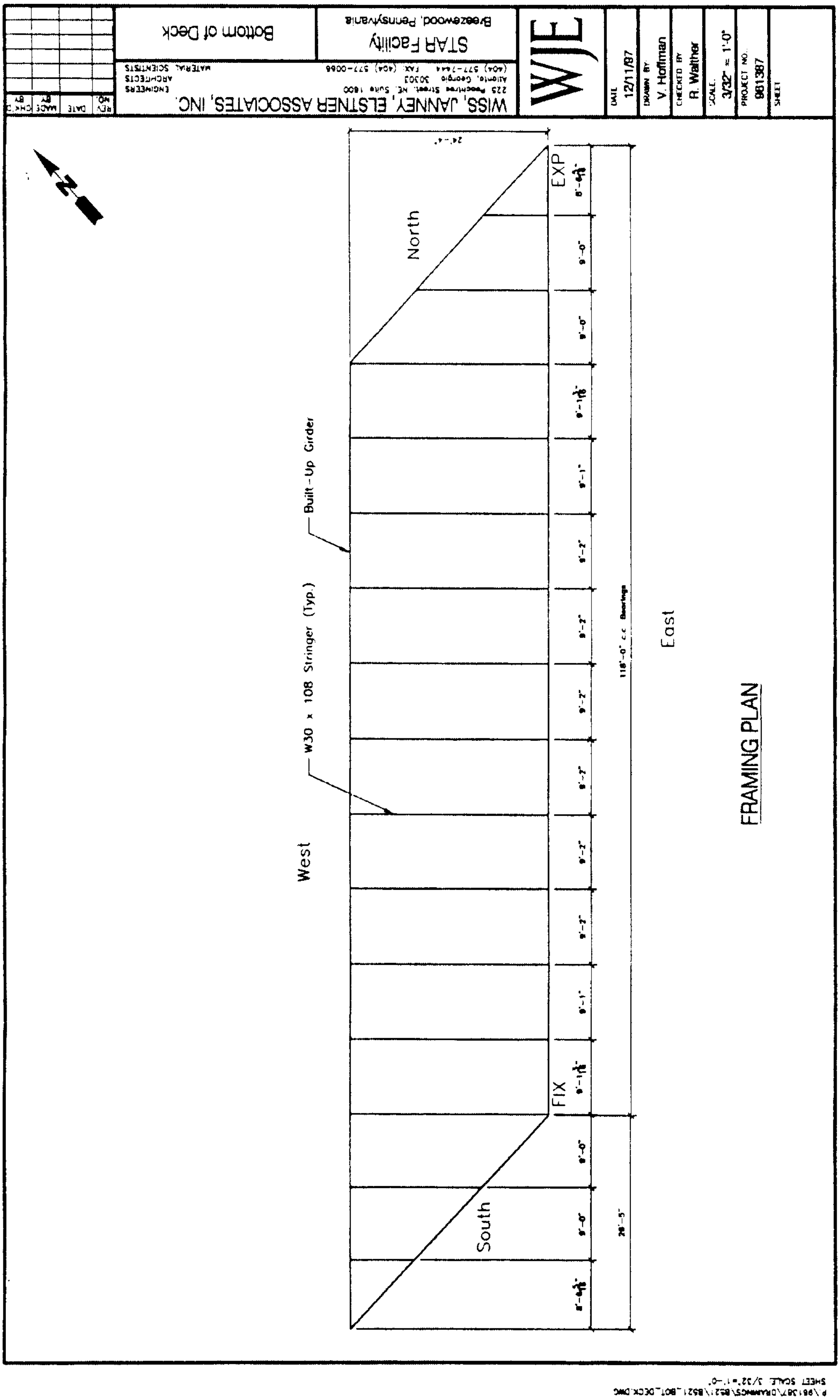
DATE: 12/11/97
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 3/32" = 1'-0"
PROJECT NO.: 981387
SHEET:

P:\981387\DRAWINGS\B521\B521_FACIA_EAST.DWG
SHEET SCALE: 3/32"=1'-0"


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX (404) 577-0068
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
Elevations
WJE
DATE 12/11/97
DRAWN BY V. Hoffman
CHECKED BY R. Walther
SCALE 3/32" = 1'-0"
PROJECT NO 961387
SHEET
REV NO
DATE
MADE BY
CHK'D BY
14'-0" MIN
East Elevation
West Elevation
ELEVATIONS



WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX (404) 577-0386
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
Half Cross Section
WJE
DATE: 12/15/97
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/2" = 1'-0"
PROJECT NO.: 961387
SHEET
REV NO. DATE MADE BY CHK'D BY
℄ ROADWAY
3 - 18" x 1/2" COVER PLATES (TYP. TOP & BOTTOM)
ASPHALT WEARING SURFACE
REINFORCED CONCRETE DECK
12'-2"
HALF CROSS SECTION OF BRIDGE


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
STAR Facility
Breezewood, Pennsylvania
Bottom of Deck
WJE
12/11/87
V. Hoffman
R. Walther
3/32" = 1'-0"
981387
North
South
East
West
EXP
FIX
W30 x 108 Stringer (Typ.)
Built-Up Girder
FRAMING PLAN

Task B

Task B

Task B

Task B

Task B

Task B

Task B

Task B

Inspector ID:

Date:

Structure Type:

TASK B
Bridge B101A

OVERALL DECK CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ______________________________

____

____

Deck Elements	Rating	Remarks
Wearing Surface	N 9 8 7 6 5 4 3 2 1 0	
Deck – Topside	N 9 8 7 6 5 4 3 2 1 0	
Deck – Underside	N 9 8 7 6 5 4 3 2 1 0	
SIP Forms	N 9 8 7 6 5 4 3 2 1 0	
Curbs	N 9 8 7 6 5 4 3 2 1 0	
Medians	N 9 8 7 6 5 4 3 2 1 0	
Sidewalks	N 9 8 7 6 5 4 3 2 1 0	
Parapets	N 9 8 7 6 5 4 3 2 1 0	
Railing	N 9 8 7 6 5 4 3 2 1 0	
Expansion Joints	N 9 8 7 6 5 4 3 2 1 0	
Drainage System	N 9 8 7 6 5 4 3 2 1 0	
Lighting	N 9 8 7 6 5 4 3 2 1 0	
Utilities	N 9 8 7 6 5 4 3 2 1 0	
____________	N 9 8 7 6 5 4 3 2 1 0	
____________	N 9 8 7 6 5 4 3 2 1 0	

Notes: ______________________________

Inspector ID:

Date:

TASK B
Bridge B101A

OVERALL SUPERSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ______________________________

Superstructure Elements	Rating	Remarks
Stringers	N 9 8 7 6 5 4 3 2 1 0	
Floorbeams	N 9 8 7 6 5 4 3 2 1 0	
Floor System Bracing	N 9 8 7 6 5 4 3 2 1 0	
Multibeams	N 9 8 7 6 5 4 3 2 1 0	
Girders	N 9 8 7 6 5 4 3 2 1 0	
Arches	N 9 8 7 6 5 4 3 2 1 0	
Cables	N 9 8 7 6 5 4 3 2 1 0	
Paint	N 9 8 7 6 5 4 3 2 1 0	
Bearing Devices	N 9 8 7 6 5 4 3 2 1 0	
Connections	N 9 8 7 6 5 4 3 2 1 0	
Welds	N 9 8 7 6 5 4 3 2 1 0	
________	N 9 8 7 6 5 4 3 2 1 0	
________	N 9 8 7 6 5 4 3 2 1 0	

Timber Decay ______________________________

Concrete Deterioration ______________________________

Steel Corrosion ______________________________

Collision Damage ______________________________

LL Deflection ______________________________

Vibration ______________________________

Member Alignment ______________________________

Utilities ______________________________

Notes: ______________________________

Inspector ID:

Date:

TASK B
Bridge B101A

OVERALL SUBSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ____

____

____

Substructure Elements	Rating											Remarks
Abutments	N	9	8	7	6	5	4	3	2	1	0	____________
Piles	N	9	8	7	6	5	4	3	2	1	0	____________
Footing	N	9	8	7	6	5	4	3	2	1	0	____________
Stem	N	9	8	7	6	5	4	3	2	1	0	____________
Bearing Seat	N	9	8	7	6	5	4	3	2	1	0	____________
Backwall	N	9	8	7	6	5	4	3	2	1	0	____________
Wingwalls	N	9	8	7	6	5	4	3	2	1	0	____________
Piers and Bents	N	9	8	7	6	5	4	3	2	1	0	____________
Piles	N	9	8	7	6	5	4	3	2	1	0	____________
Footing	N	9	8	7	6	5	4	3	2	1	0	____________
Columns/Stem	N	9	8	7	6	5	4	3	2	1	0	____________
Cap	N	9	8	7	6	5	4	3	2	1	0	____________
________	N	9	8	7	6	5	4	3	2	1	0	____________
________	N	9	8	7	6	5	4	3	2	1	0	____________

Scour/Undermining ______________________________

Settlement ______________________________

Substructure Protection ______________________________

Collision Damage ______________________________

High-water Mark ______________________________

Concrete Deterioration ______________________________

Steel Corrosion ______________________________

Paint ______________________________

Notes: ____

____

____

____

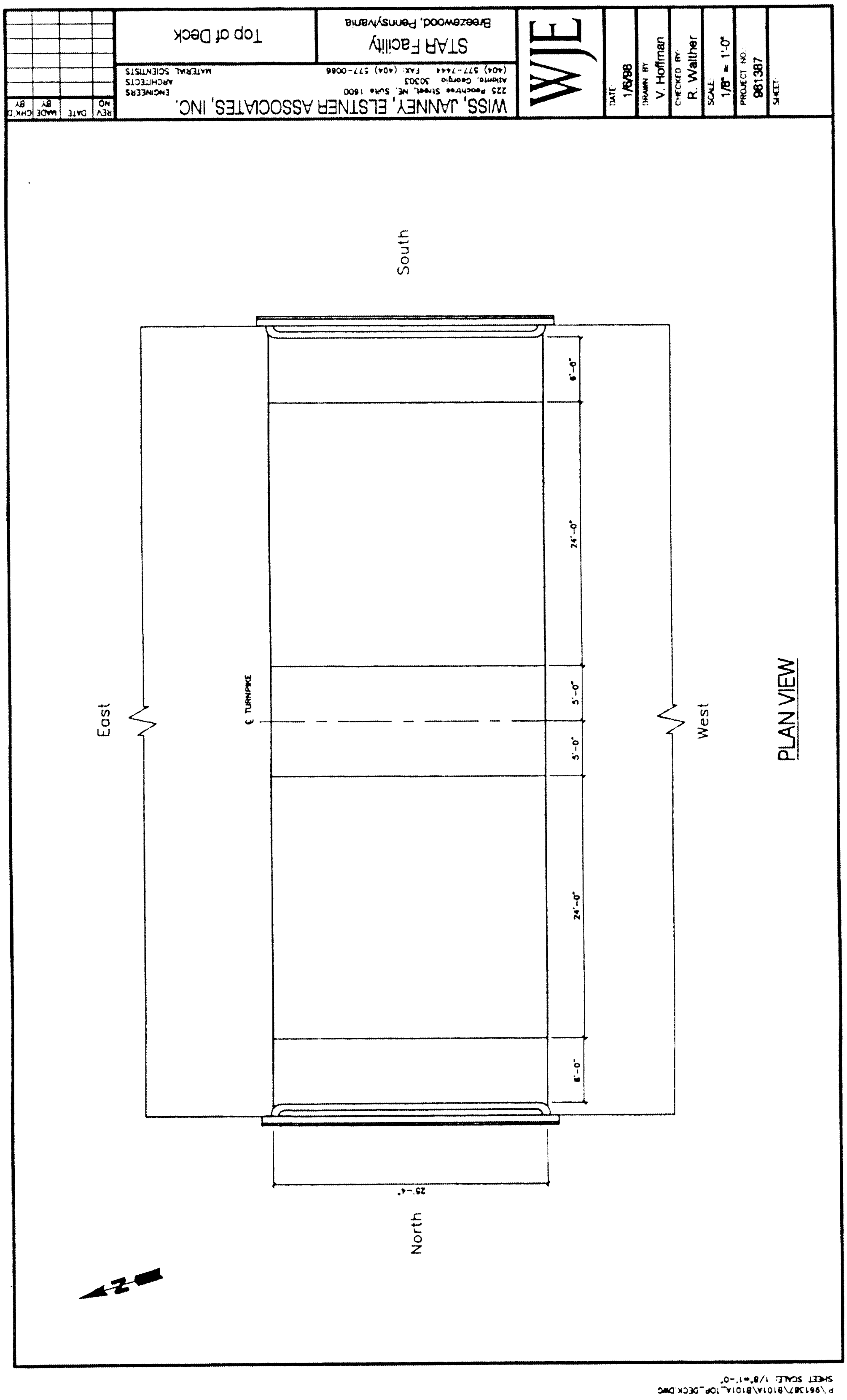
____

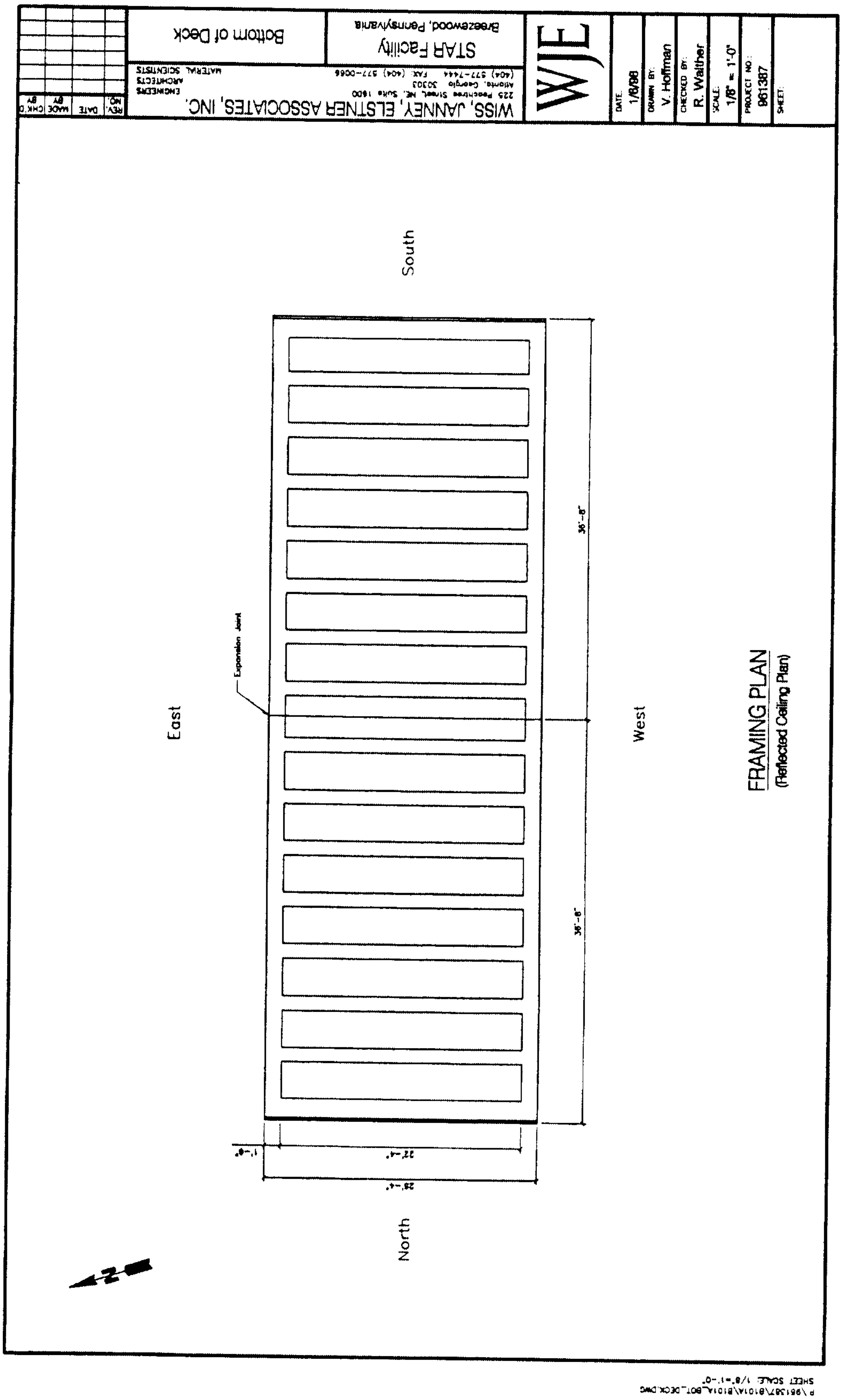
____

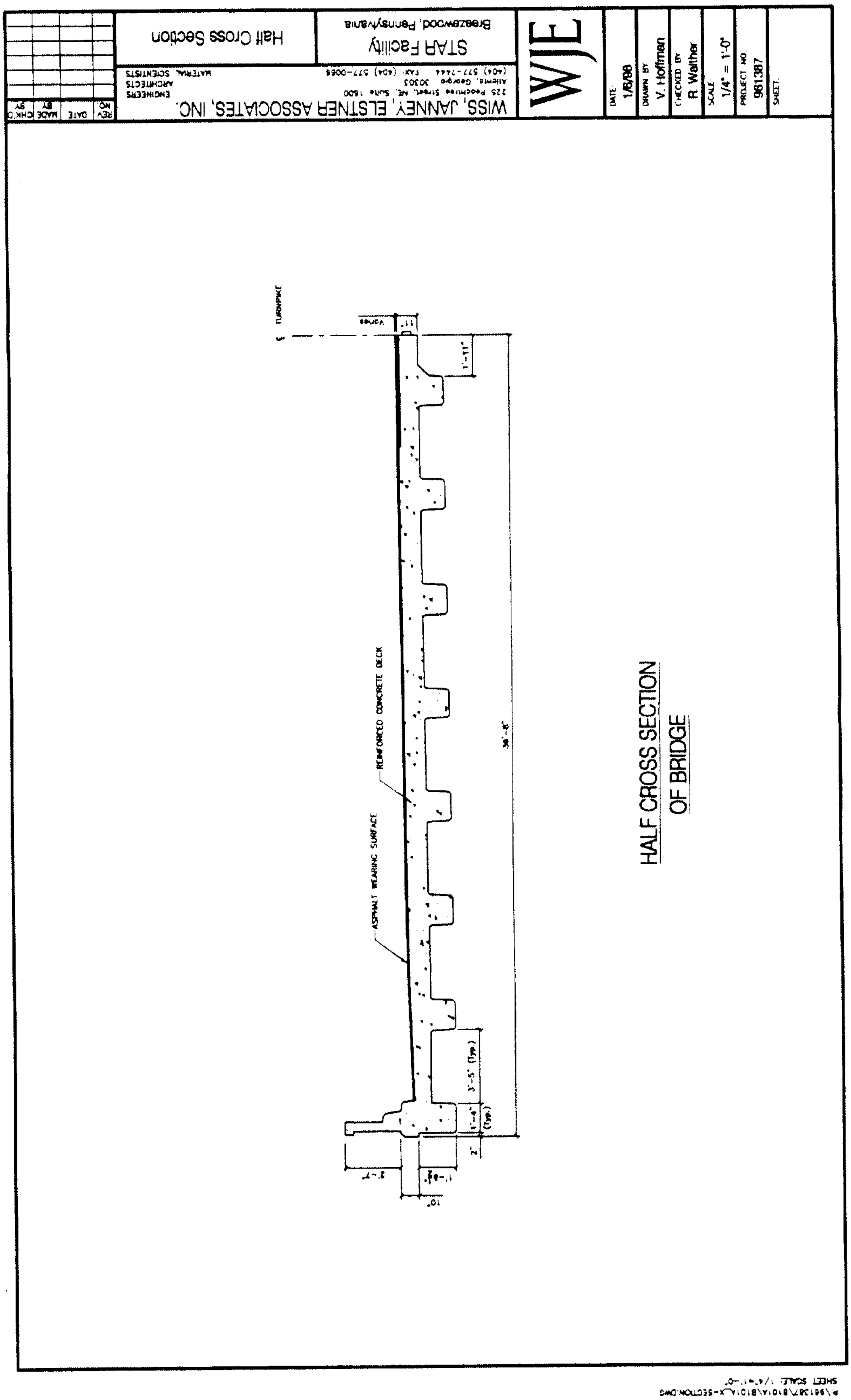
____

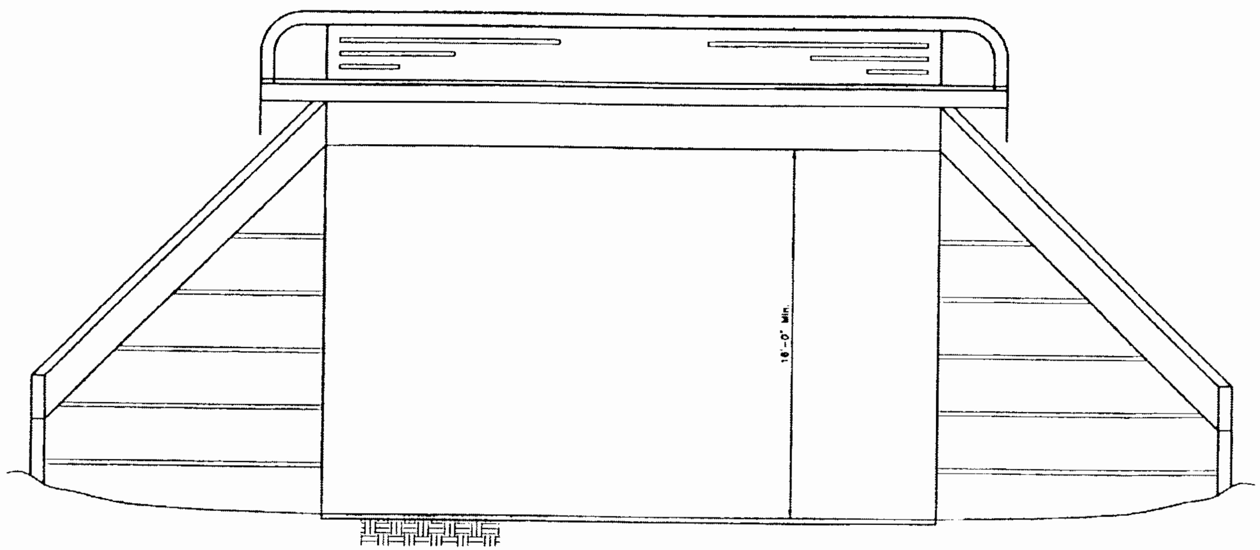
____

____


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1800
Atlanta, Georgia 30303
(404) 577-7444 FAX: (404) 577-0086
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
Top of Deck
WJE
DATE 1/6/98
DRAWN BY V. Hoffman
CHECKED BY R. Walther
SCALE 1/8" = 1'-0"
PROJECT NO. 981387
SHEET
South
East
West
North
℄ TURNPIKE
6'-0"
24'-0"
5'-0"
5'-0"
24'-0"
6'-0"
25'-4"
PLAN VIEW
N
SHEET SCALE: 1/8"=1'-0"


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
Bottom of Deck
WJE
DATE:
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/8" = 1'-0"
PROJECT NO.: 961387
SHEET:
REV. NO.
DATE
MADE BY
CHK'D BY
South
East
West
North
Expansion Joint
36'-8"
36'-8"
22'-4"
1'-6"
25'-4"
FRAMING PLAN
(Reflected Ceiling Plan)
SHEET SCALE 1/8"=1'-0"


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX: (404) 577-0068
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
Half Cross Section
WJE
DATE: 1/8/98
DRAWN BY V. Hoffman
CHECKED BY R. Walther
SCALE 1/4" = 1'-0"
PROJECT NO. 981387
SHEET
HALF CROSS SECTION OF BRIDGE
REINFORCED CONCRETE DECK
ASPHALT WEARING SURFACE
TURNPIKE
Varies
36'-8"
1'-11"
3'-5" (Typ.)



North Elevation

ELEVATIONS

WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX: (404) 577-0086
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS

STAR Facility
Breezewood, Pennsylvania

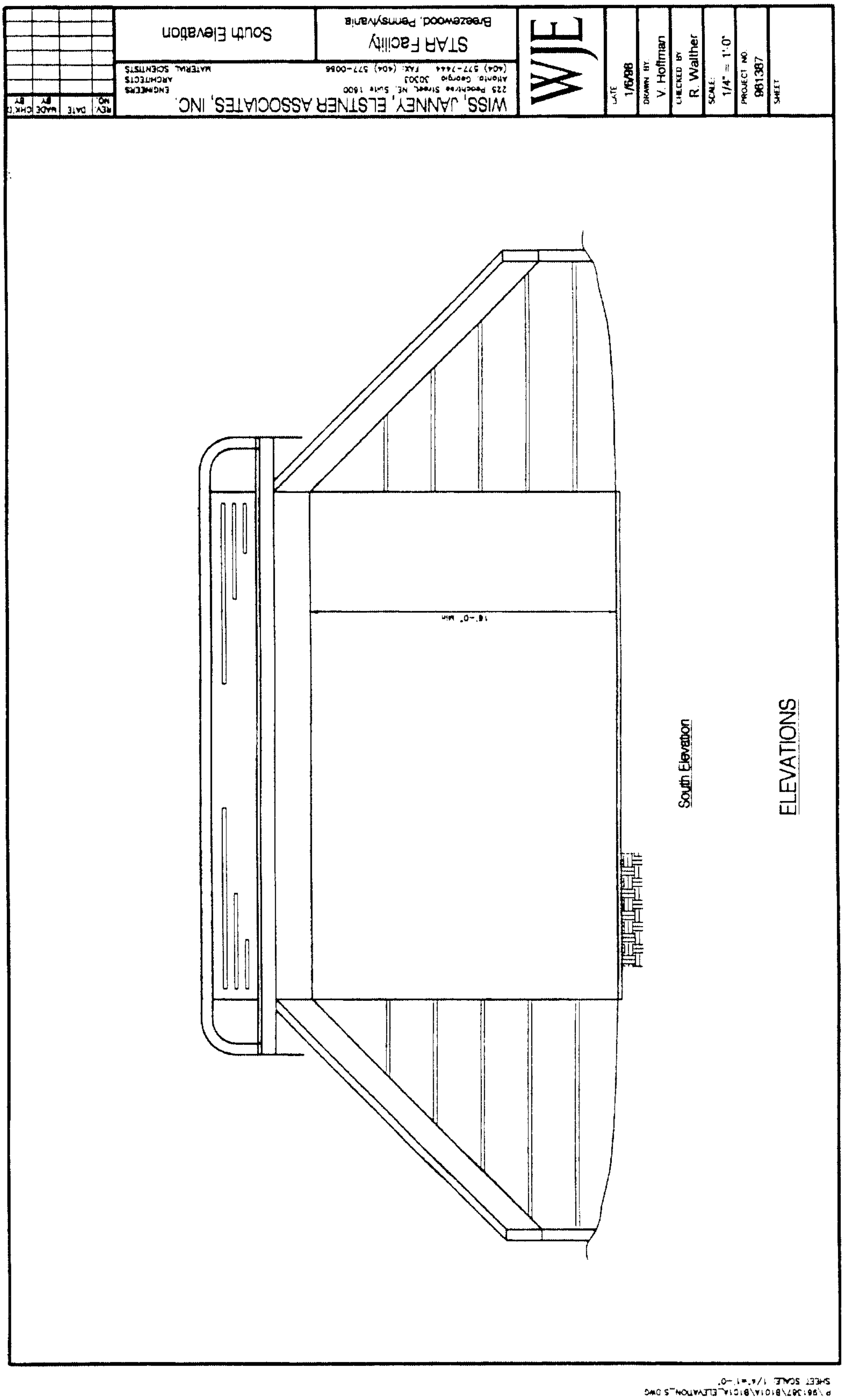
North Elevation

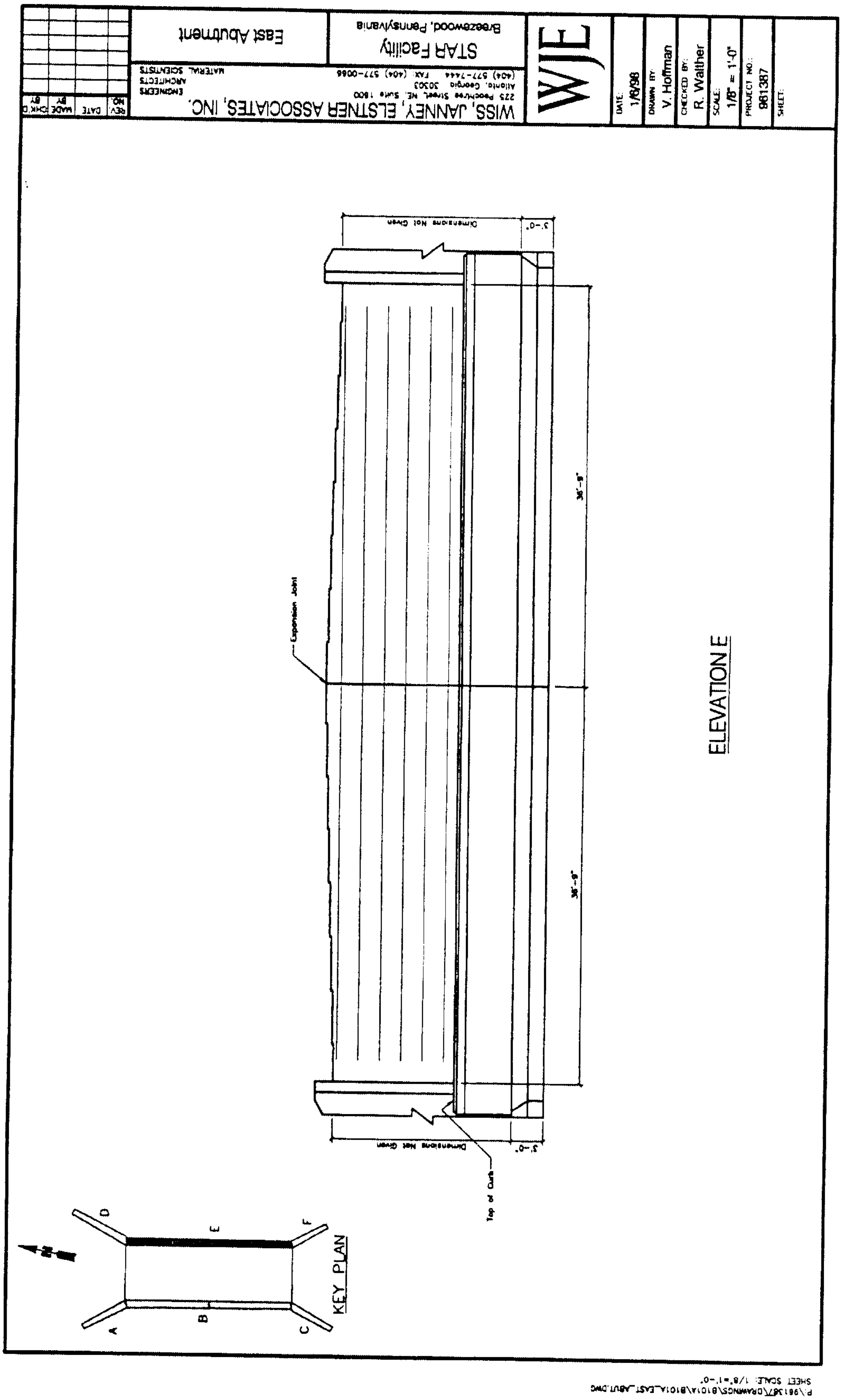
REV NO.	DATE	MADE BY	CHK'D BY

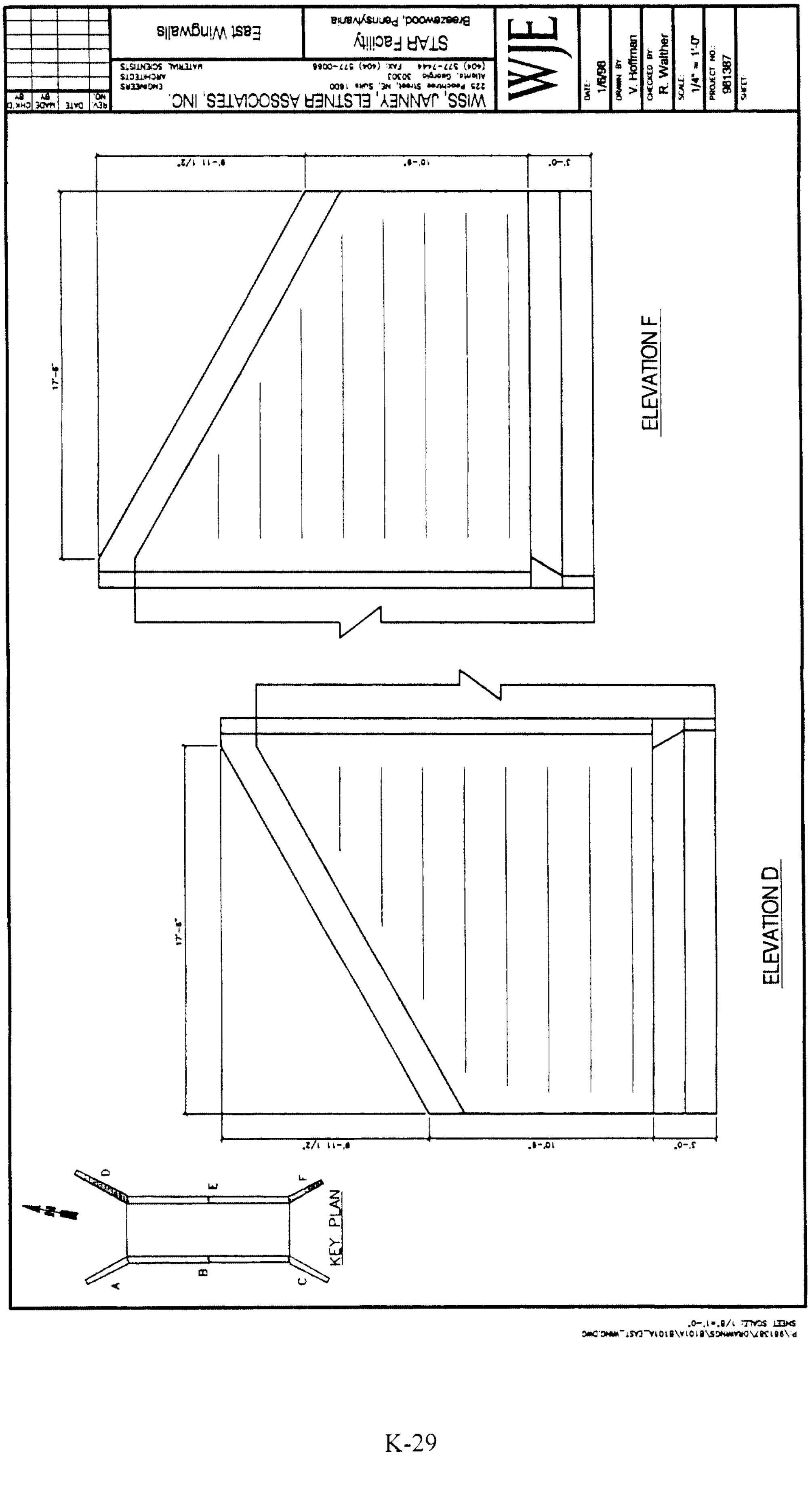
WJE

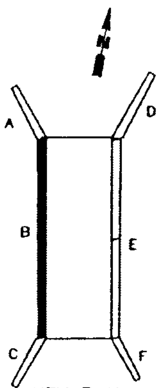
DATE: 1/6/98
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/4" = 1'-0"
PROJECT NO.: 961387
SHEET:

P:\961387\B101A\B101A_ELEVATION_N.DWG
SHEET SCALE: 1/4"=1'-0"

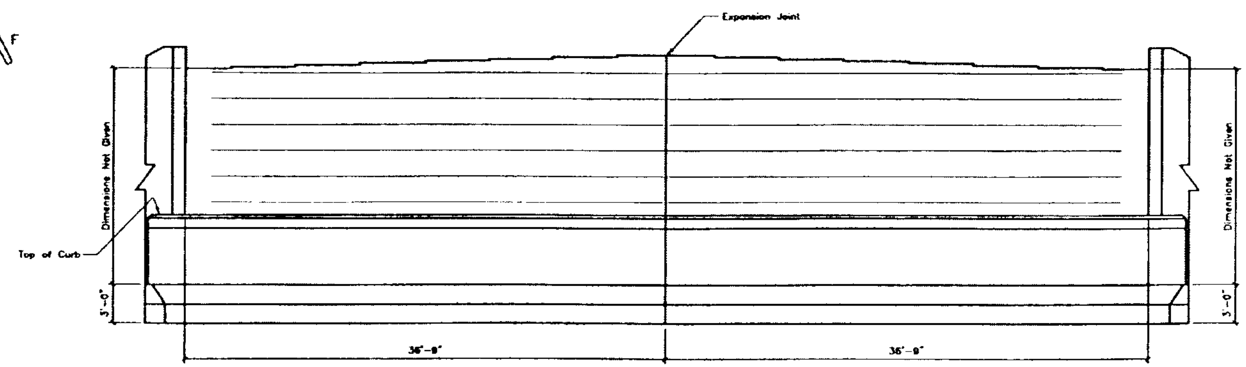

WISS, JANNEY, ELSTNER ASSOCIATES, INC.
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
South Elevation
WJE
DATE
1/6/98
DRAWN BY
V. Hoffman
CHECKED BY
R. Walther
SCALE
1/4" = 1'-0"
PROJECT NO.
981387
SHEET
18'-0" Min
South Elevation
ELEVATIONS


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1800
Atlanta, Georgia 30303
(404) 577-7444 FAX (404) 577-0066
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
East Abutment
WJE
DATE: 1/8/98
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/8" = 1'-0"
PROJECT NO.: 981387
SHEET:
REV NO.
DATE
MADE BY
CHK'D BY
Dimensions Not Given
3'-0"
36'-9"
36'-9"
Expansion Joint
Top of Curb
ELEVATION E
KEY PLAN
A
B
C
D
E
F
SHEET SCALE: 1/8"=1'-0"


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
STAR Facility
Breezewood, Pennsylvania
East Wingwalls
WJE
1/6/98
V. Hoffman
R. Walther
1/4" = 1'-0"
981387
17'-6"
10'-6"
2'-0"
ELEVATION F
ELEVATION D
KEY PLAN
A
B
C
D
E
F
N



KEY PLAN



ELEVATION B

WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX: (404) 577-0066
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS

WJE

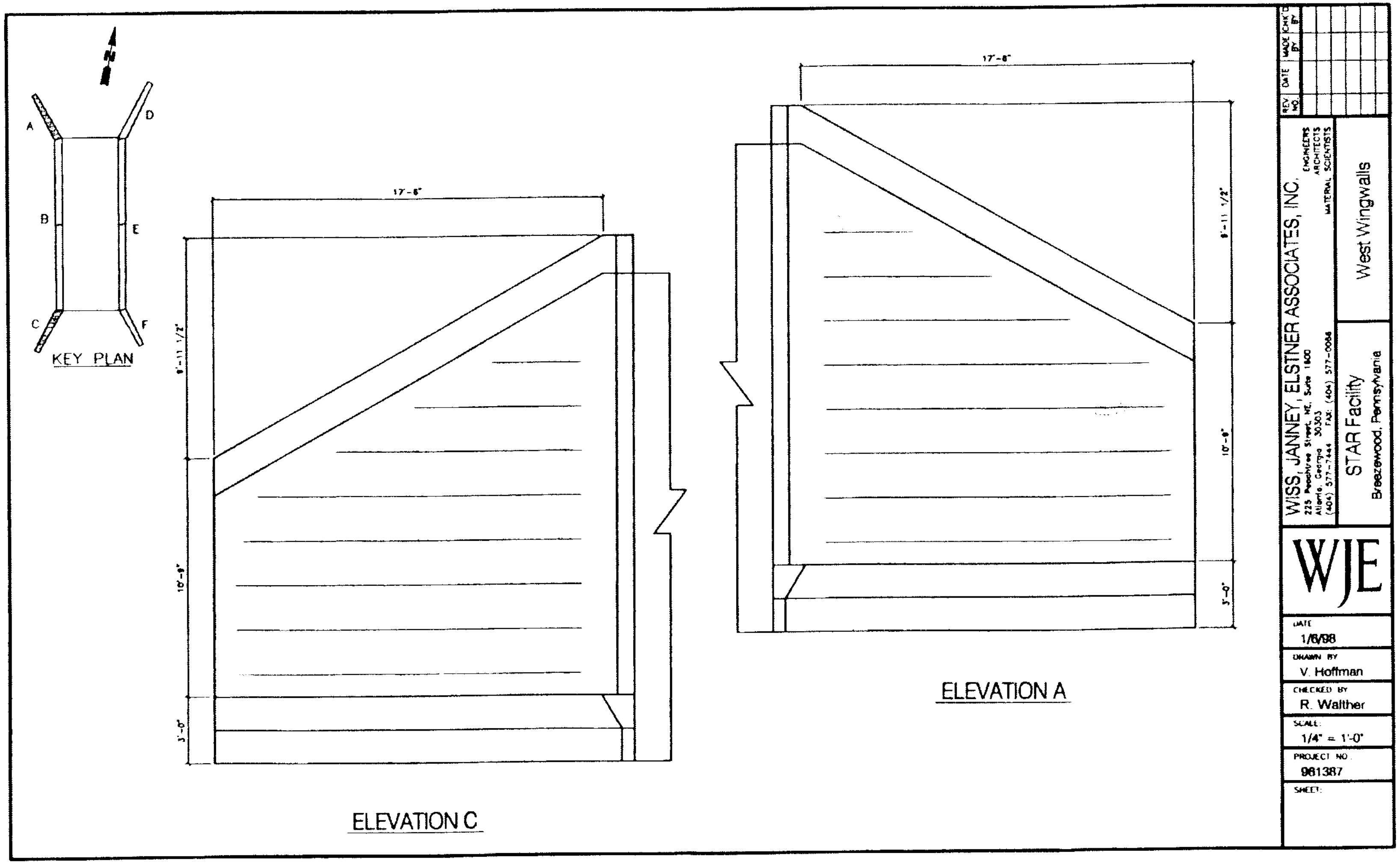
STAR Facility
Breezewood, Pennsylvania

West Abutment

REV. NO.	DATE	MADE BY	CHK'D BY

DATE: 1/8/98
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/8" = 1'-0"
PROJECT NO.: 981387
SHEET:

P:\981387\DRAWINGS\B101A\B101A_WEST_ABUT.DWG
SHEET SCALE: 1/8"=1'-0"


KEY PLAN
A
B
C
D
E
F
ELEVATION C
17'-8"
9'-11 1/2"
10'-9"
3'-0"
ELEVATION A
WISS, JANNEY, ELSTNER ASSOCIATES, INC.
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
West Wingwalls
WJE
DATE
1/6/98
DRAWN BY
V. Hoffman
CHECKED BY
R. Walther
SCALE:
1/4" = 1'-0"
PROJECT NO.
981387
SHEET:
REV NO.
DATE
MADE BY
CHK'D BY

Task C

Task C

Task C

Task C

Task C

Task C

Task C

Task C

Inspector ID:

Date:

Structure Type:

TASK C
Bridge B111A

OVERALL DECK CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ______________________________

Deck Elements	Rating											Remarks
Wearing Surface	N	9	8	7	6	5	4	3	2	1	0	
Deck – Topside	N	9	8	7	6	5	4	3	2	1	0	
Deck – Underside	N	9	8	7	6	5	4	3	2	1	0	
SIP Forms	N	9	8	7	6	5	4	3	2	1	0	
Curbs	N	9	8	7	6	5	4	3	2	1	0	
Medians	N	9	8	7	6	5	4	3	2	1	0	
Sidewalks	N	9	8	7	6	5	4	3	2	1	0	
Parapets	N	9	8	7	6	5	4	3	2	1	0	
Railing	N	9	8	7	6	5	4	3	2	1	0	
Expansion Joints	N	9	8	7	6	5	4	3	2	1	0	
Drainage System	N	9	8	7	6	5	4	3	2	1	0	
Lighting	N	9	8	7	6	5	4	3	2	1	0	
Utilities	N	9	8	7	6	5	4	3	2	1	0	
____________	N	9	8	7	6	5	4	3	2	1	0	
____________	N	9	8	7	6	5	4	3	2	1	0	

Notes: ______________________________

Inspector ID:

Date:

TASK C
Bridge B111A

OVERALL SUPERSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ______________________________

Superstructure Elements	Rating	Remarks
Stringers	N 9 8 7 6 5 4 3 2 1 0	______
Floorbeams	N 9 8 7 6 5 4 3 2 1 0	______
Floor System Bracing	N 9 8 7 6 5 4 3 2 1 0	______
Multibeams	N 9 8 7 6 5 4 3 2 1 0	______
Girders	N 9 8 7 6 5 4 3 2 1 0	______
Arches	N 9 8 7 6 5 4 3 2 1 0	______
Cables	N 9 8 7 6 5 4 3 2 1 0	______
Paint	N 9 8 7 6 5 4 3 2 1 0	______
Bearing Devices	N 9 8 7 6 5 4 3 2 1 0	______
Connections	N 9 8 7 6 5 4 3 2 1 0	______
Welds	N 9 8 7 6 5 4 3 2 1 0	______
______	N 9 8 7 6 5 4 3 2 1 0	______
______	N 9 8 7 6 5 4 3 2 1 0	______

Timber Decay	______
Concrete Deterioration	______
Steel Corrosion	______
Collision Damage	______
LL Deflection	______
Vibration	______
Member Alignment	______
Utilities	______

Notes: ______________________________

Inspector ID:

Date:

TASK C
Bridge B111A

OVERALL SUBSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ____

Substructure Elements	Rating	Remarks
Abutments	N 9 8 7 6 5 4 3 2 1 0	______
Piles	N 9 8 7 6 5 4 3 2 1 0	______
Footing	N 9 8 7 6 5 4 3 2 1 0	______
Stem	N 9 8 7 6 5 4 3 2 1 0	______
Bearing Seat	N 9 8 7 6 5 4 3 2 1 0	______
Backwall	N 9 8 7 6 5 4 3 2 1 0	______
Wingwalls	N 9 8 7 6 5 4 3 2 1 0	______
Piers and Bents	N 9 8 7 6 5 4 3 2 1 0	______
Piles	N 9 8 7 6 5 4 3 2 1 0	______
Footing	N 9 8 7 6 5 4 3 2 1 0	______
Columns/Stem	N 9 8 7 6 5 4 3 2 1 0	______
Cap	N 9 8 7 6 5 4 3 2 1 0	______
______	N 9 8 7 6 5 4 3 2 1 0	______
______	N 9 8 7 6 5 4 3 2 1 0	______

Scour/Undermining ____

Settlement ____

Substructure Protection ____

Collision Damage ____

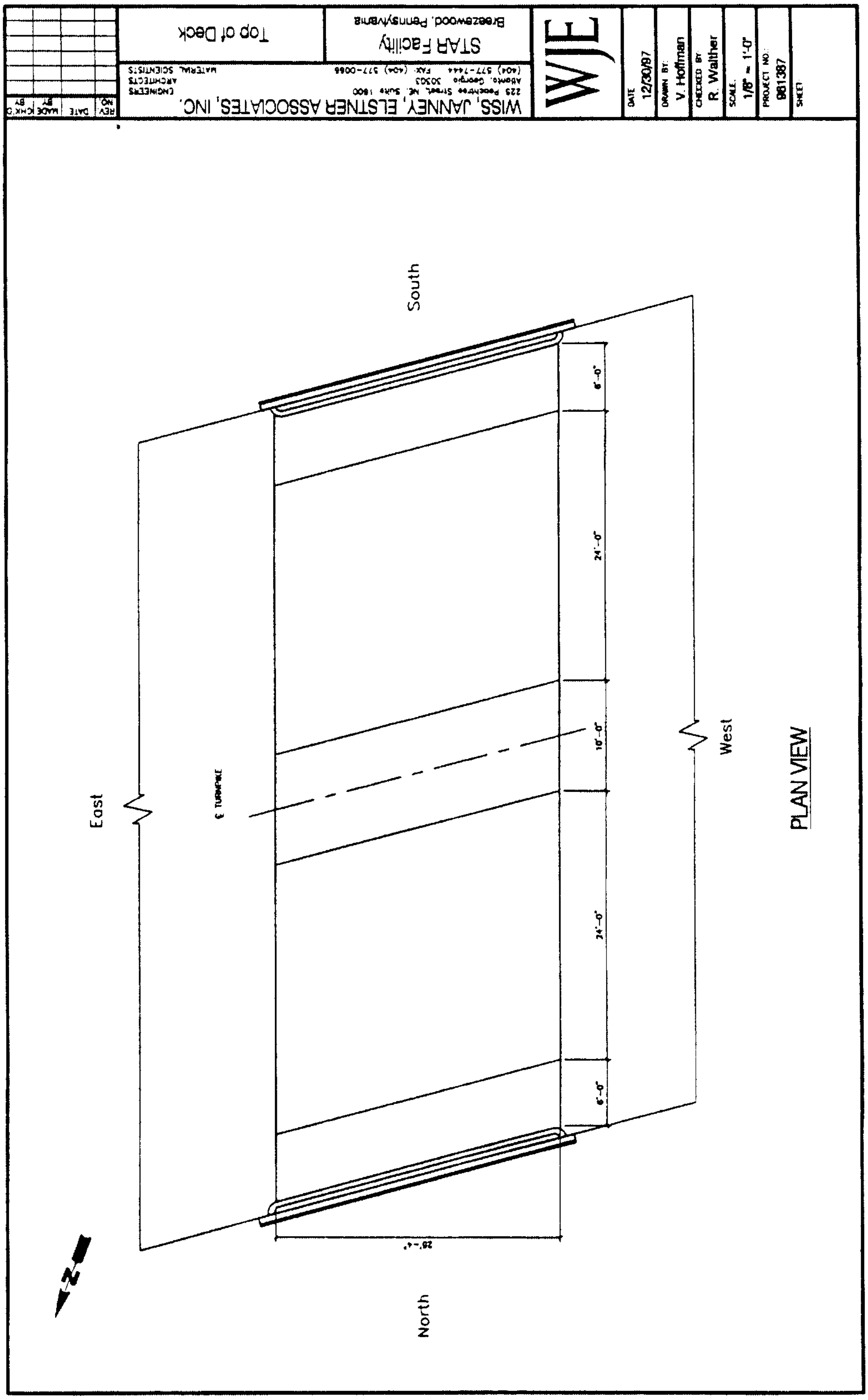
High-water Mark ____

Concrete Deterioration ____

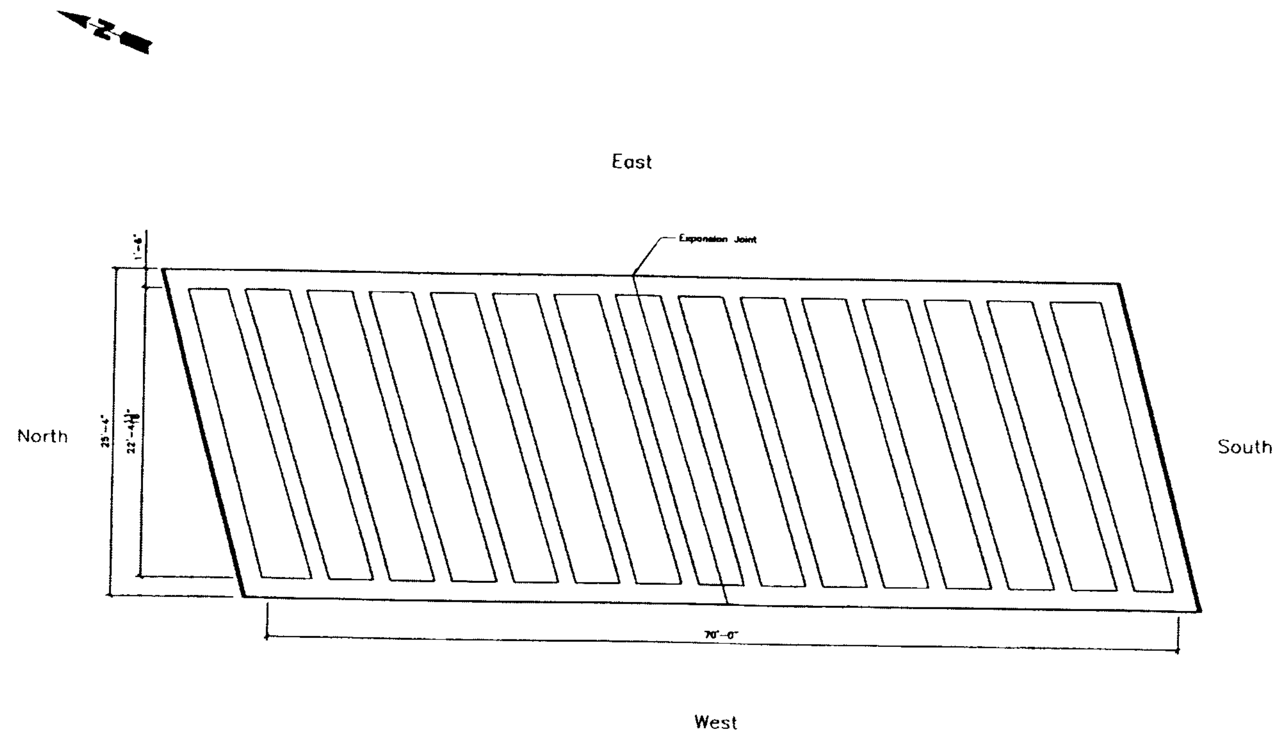
Steel Corrosion ____

Paint ____

Notes: ____



WISS, JANNEY, ELSTNER ASSOCIATES, INC.
STAR Facility
Breezewood, Pennsylvania
Top of Deck
WJE
DATE 12/30/97
DRAWN BY: V. Hoffman
CHECKED BY R. Walther
SCALE: 1/8" = 1'-0"
PROJECT NO.: 981387
SHEET
South
North
East
West
6'-0"
24'-0"
10'-0"
24'-0"
6'-0"
28'-4"
℄ TURNPIKE
N
PLAN VIEW



FRAMING PLAN
(Reflected Ceiling Plan)

REV. NO.	DATE	MADE BY	CHK'D BY

WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX (404) 577-0066
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS

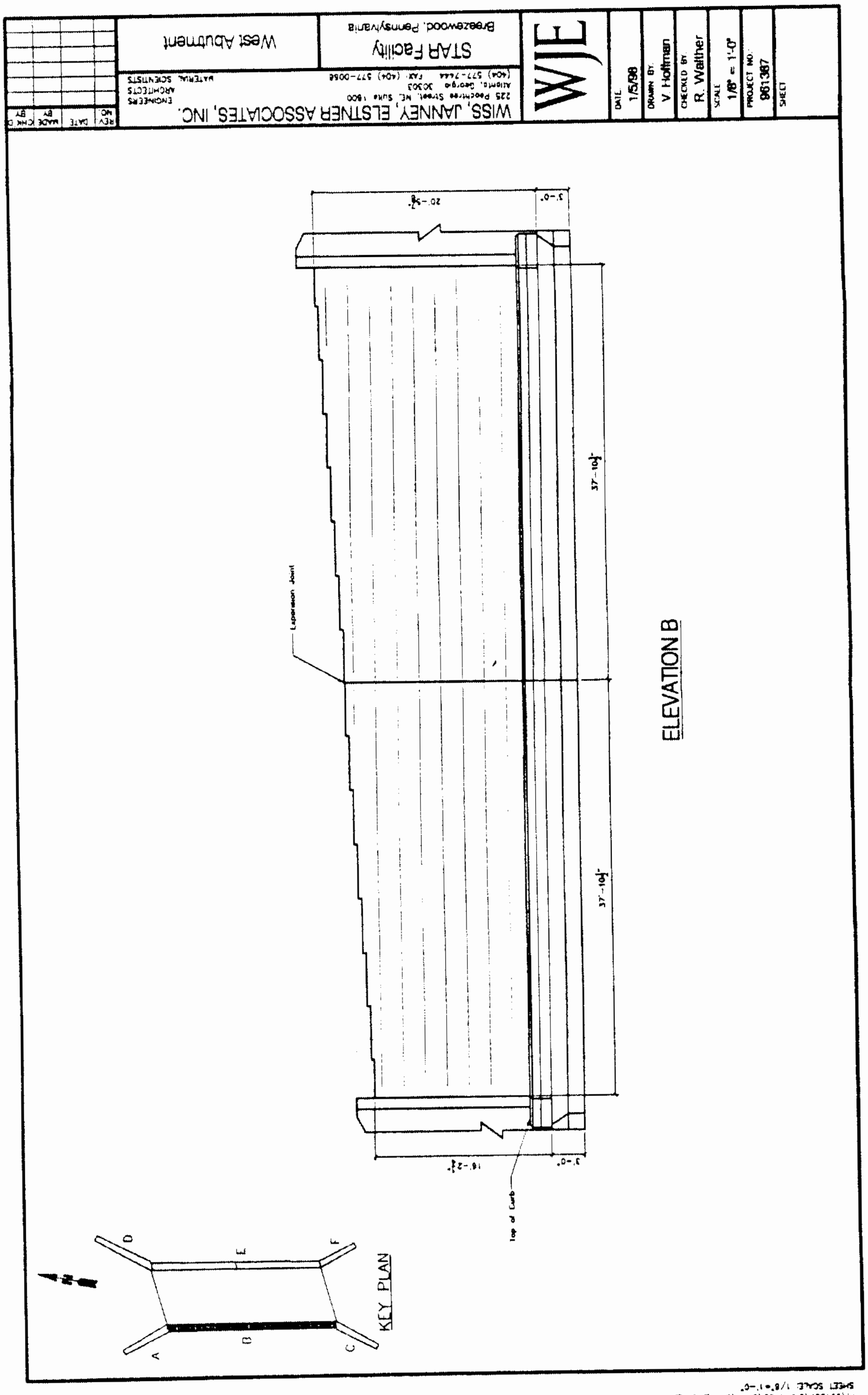
Bottom of Deck

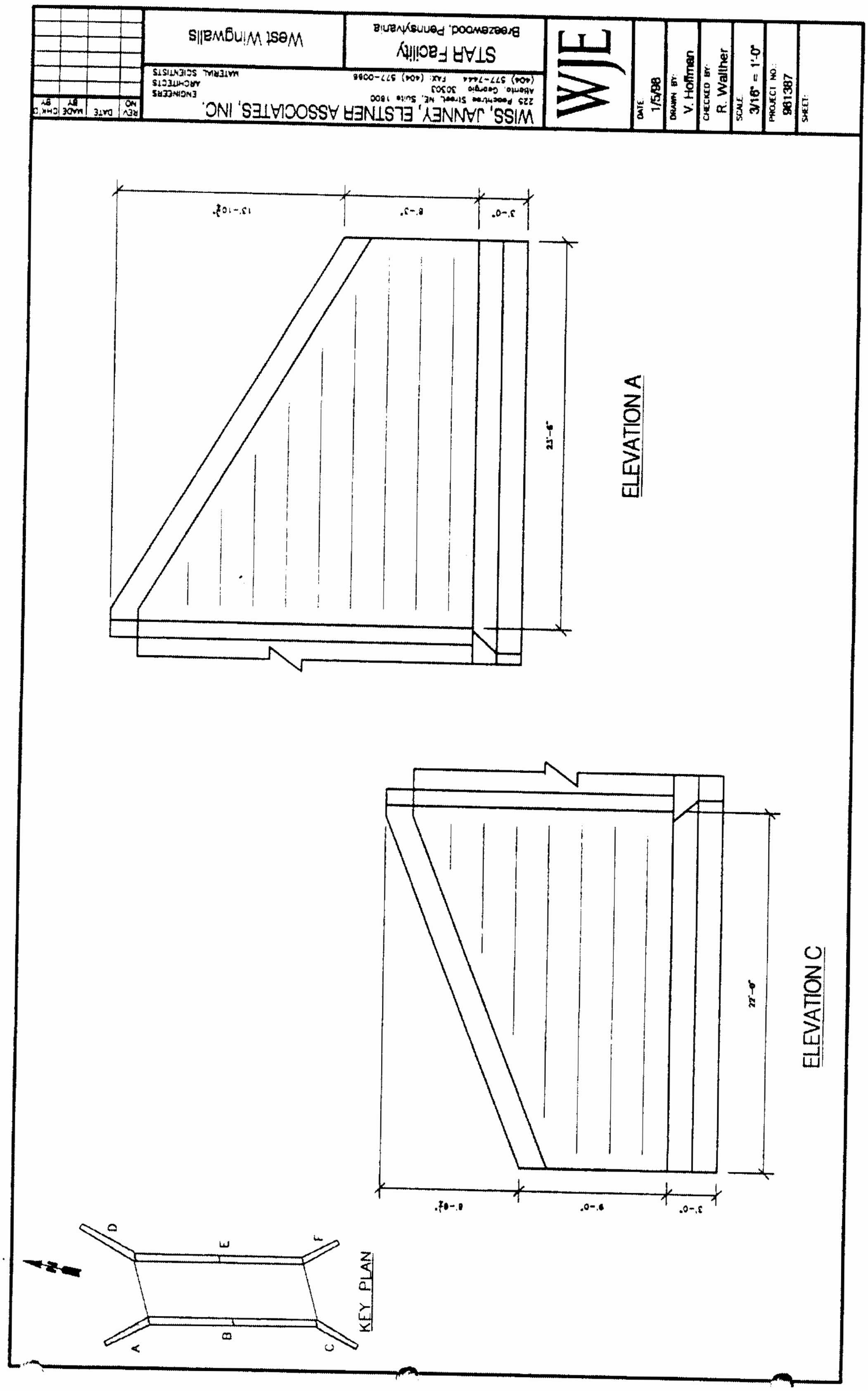
STAR Facility
Breezewood, Pennsylvania

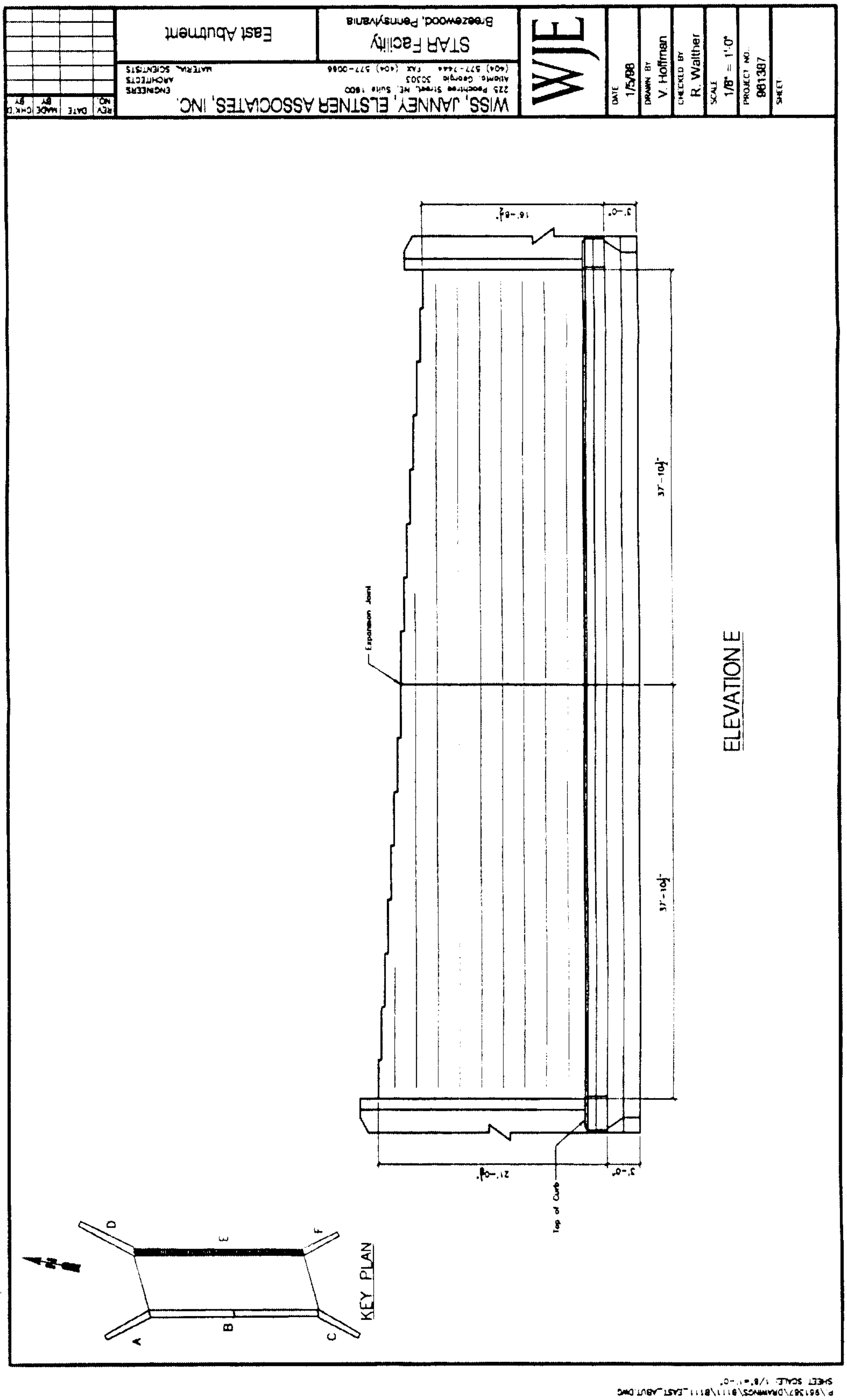
WJE

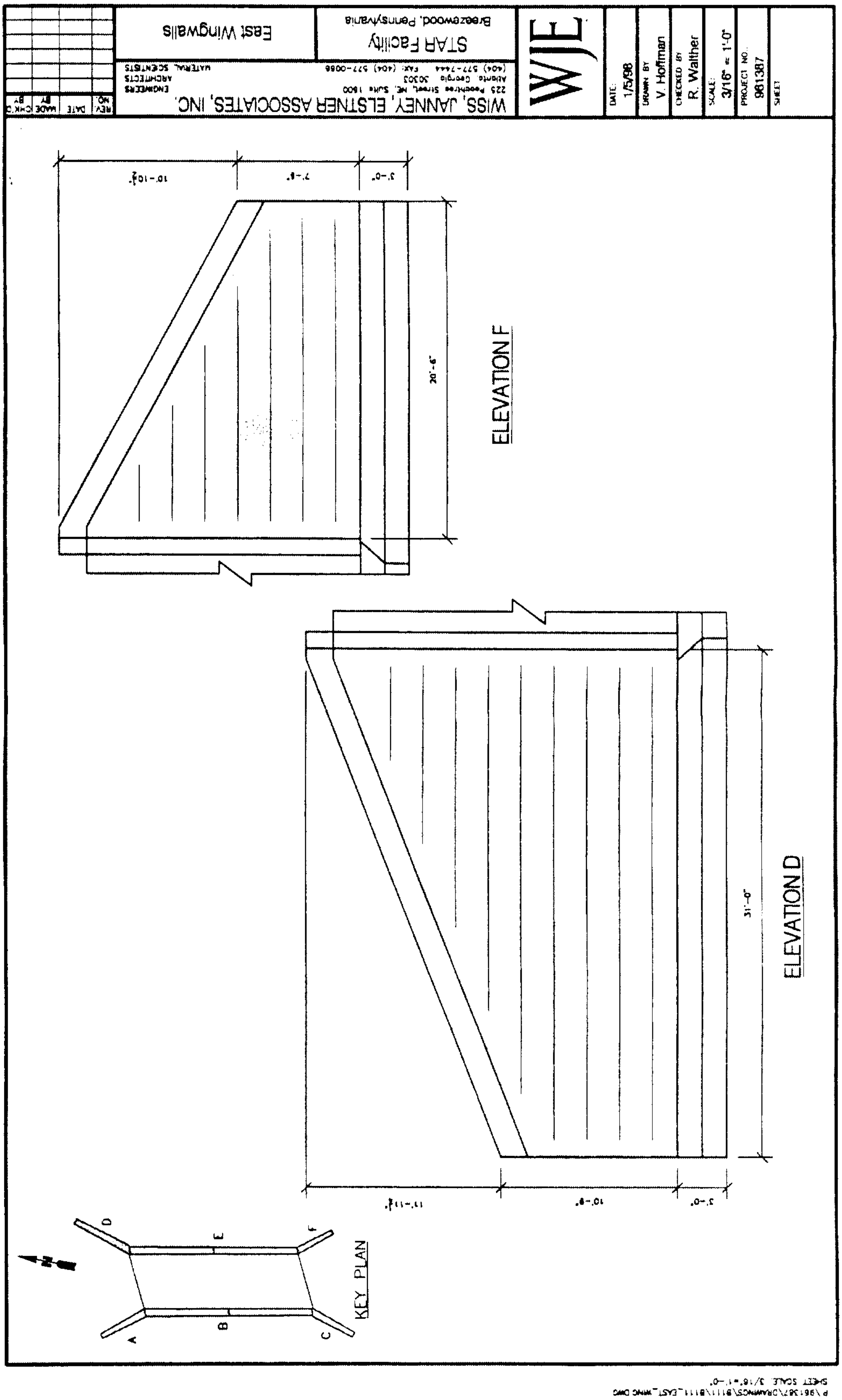
DATE: 12/30/97
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/8" = 1'-0"
PROJECT NO.: 961387
SHEET:

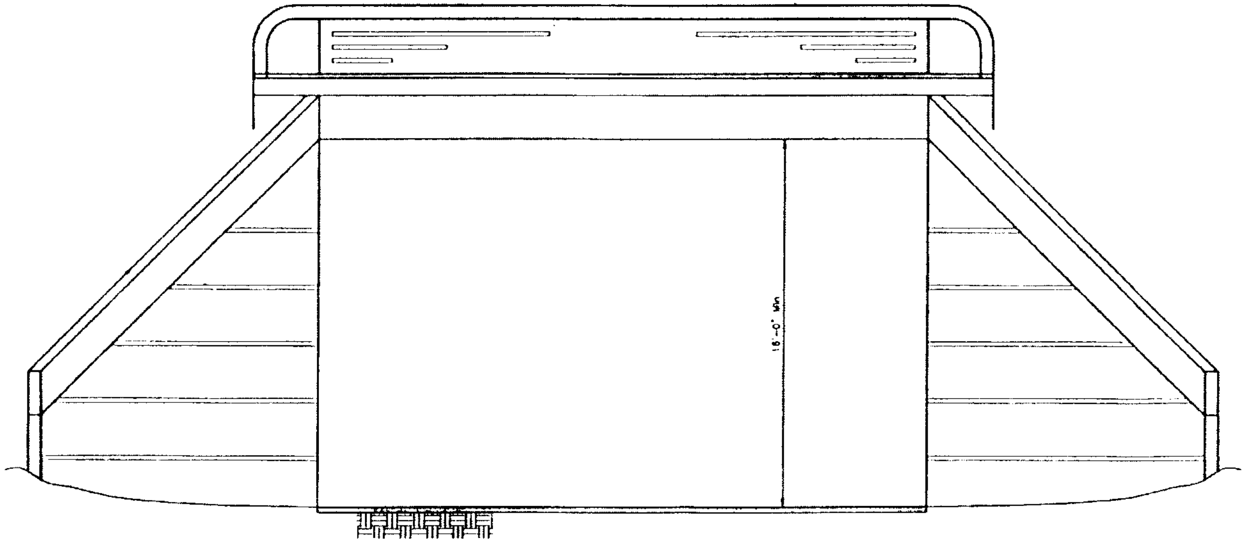
P:\961387\B111\B111_BOT_DECK.DWG
SHEET SCALE: 1/8"=1'-0"


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
West Abutment
WJE
DATE 1/5/98
DRAWN BY V Hoffman
CHECKED BY R. Walther
SCALE 1/8" = 1'-0"
PROJECT NO. 961387
SHEET
REV NO.
DATE
MADE BY
CHK'D BY
ELEVATION B
Expansion Joint
Top of Curb
3'-0"
20'-5⅝"
37'-10½"
37'-10½"
16'-2¼"
3'-0"
KEY PLAN
A
B
C
D
E
F


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
WJE
STAR Facility
Breezewood, Pennsylvania
West Wingwalls
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
DATE 1/5/98
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE 3/16" = 1'-0"
PROJECT NO: 981387
SHEET:
ELEVATION A
ELEVATION C
KEY PLAN
13'-10½"
8'-3"
3'-0"
23'-6"
9'-0"
3'-0"


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
ENGINEERS ARCHITECTS MATERIAL SCIENTISTS
225 Peachtree Street, NE, Suite 1800
Atlanta, Georgia 30303
(404) 577-7444 FAX (404) 577-0086
STAR Facility
Breezewood, Pennsylvania
East Abutment
WJE
DATE 1/5/88
DRAWN BY V. Hoffman
CHECKED BY R. Walther
SCALE 1/8" = 1'-0"
PROJECT NO. 981387
SHEET
REV NO. DATE MADE BY CHK'D BY
16'-6½"
3'-0"
37'-10½"
37'-10½"
21'-0½"
3'-0"
Expansion Joint
Top of Curb
ELEVATION E
KEY PLAN
A
B
C
D
E
F


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
East Wingwalls
WJE
DATE: 1/5/98
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 3/16" = 1'-0"
PROJECT NO.: 981387
SHEET
REV. NO.
DATE
MADE BY
CHK'D BY
ELEVATION F
10'-10½"
7'-6"
3'-0"
20'-6"
ELEVATION D
13'-11½"
10'-6"
3'-0"
31'-0"
KEY PLAN
A
B
C
D
E
F
SHEET SCALE 3/16"=1'-0"
P:\981387\DRAWINGS\B111\B111_EAST_WING.DWG



South Elevation

ELEVATIONS

REV. NO.	DATE | MADE BY | CHK'D BY

WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7644 FAX: (404) 577-0066
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS

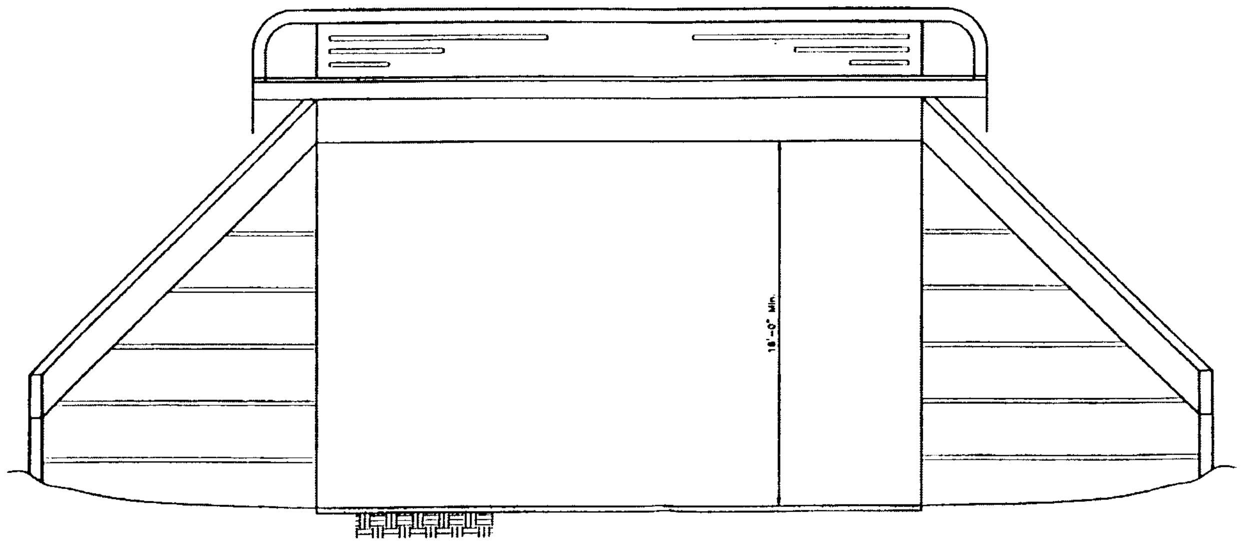
STAR Facility
Breezewood, Pennsylvania

South Elevation

WJE

DATE: 1/6/98
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/4" = 1'-0"
PROJECT NO.: 961387
SHEET:

P:\961387\B111\B111_ELEVATION_S.DWG
SHEET SCALE: 1/4"=1'-0"



North Elevation

ELEVATIONS

P:\961387\B111\B111_ELEVATION_N.DWG
SHEET SCALE: 1/4"=1'-0"

REV NO.	DATE	MADE BY	CHK'D BY

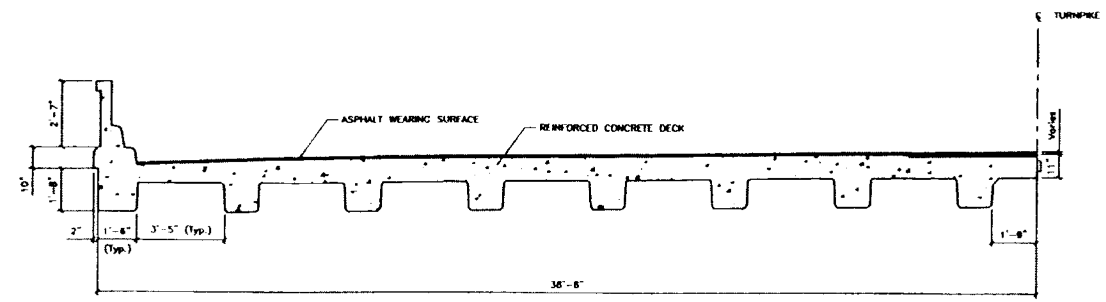
WISS, JANNEY, ELSTNER ASSOCIATES, INC.
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
225 Peachtree Street, NE, Suite 1800
Atlanta, Georgia 30303
(404) 577-7444 FAX: (404) 577-0066

North Elevation

STAR Facility
Breezewood, Pennsylvania

WJE

DATE: 1/8/98
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/4" = 1'-0"
PROJECT NO.: 961387
SHEET:



HALF CROSS SECTION OF BRIDGE

WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX (404) 577-0066
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS

STAR Facility
Breezewood, Pennsylvania

Half Cross Section

REV. NO.	DATE	MADE BY	CHK'D BY

WJE

DATE: 12/31/97
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/4" = 1'-0"
PROJECT NO.: 961387
SHEET:

P:\961387\B111\B111_X-SECTION.DWG
SHEET SCALE 1/4"=1'-0"

Task D

Task D

Task D

Task D

Task D

Task D

Task D

Task D

Inspector ID:

Date:

Structure Type:

TASK D
Bridge B543

OVERALL DECK CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ____

____

____

Deck Elements	Rating											Remarks
Wearing Surface	N	9	8	7	6	5	4	3	2	1	0	______
Deck – Topside	N	9	8	7	6	5	4	3	2	1	0	______
Deck – Underside	N	9	8	7	6	5	4	3	2	1	0	______
SIP Forms	N	9	8	7	6	5	4	3	2	1	0	______
Curbs	N	9	8	7	6	5	4	3	2	1	0	______
Medians	N	9	8	7	6	5	4	3	2	1	0	______
Sidewalks	N	9	8	7	6	5	4	3	2	1	0	______
Parapets	N	9	8	7	6	5	4	3	2	1	0	______
Railing	N	9	8	7	6	5	4	3	2	1	0	______
Expansion Joints	N	9	8	7	6	5	4	3	2	1	0	______
Drainage System	N	9	8	7	6	5	4	3	2	1	0	______
Lighting	N	9	8	7	6	5	4	3	2	1	0	______
Utilities	N	9	8	7	6	5	4	3	2	1	0	______
______	N	9	8	7	6	5	4	3	2	1	0	______
______	N	9	8	7	6	5	4	3	2	1	0	______

Notes: ____

Inspector ID:

Date:

TASK D
Bridge B543

OVERALL SUPERSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ______________________________

Superstructure Elements	Rating	Remarks
Stringers	N 9 8 7 6 5 4 3 2 1 0	________
Floorbeams	N 9 8 7 6 5 4 3 2 1 0	________
Floor System Bracing	N 9 8 7 6 5 4 3 2 1 0	________
Multibeams	N 9 8 7 6 5 4 3 2 1 0	________
Girders	N 9 8 7 6 5 4 3 2 1 0	________
Arches	N 9 8 7 6 5 4 3 2 1 0	________
Cables	N 9 8 7 6 5 4 3 2 1 0	________
Paint	N 9 8 7 6 5 4 3 2 1 0	________
Bearing Devices	N 9 8 7 6 5 4 3 2 1 0	________
Connections	N 9 8 7 6 5 4 3 2 1 0	________
Welds	N 9 8 7 6 5 4 3 2 1 0	________
________	N 9 8 7 6 5 4 3 2 1 0	________
________	N 9 8 7 6 5 4 3 2 1 0	________

Timber Decay ______________________________

Concrete Deterioration ______________________________

Steel Corrosion ______________________________

Collision Damage ______________________________

LL Deflection ______________________________

Vibration ______________________________

Member Alignment ______________________________

Utilities ______________________________

Notes: ______________________________

Inspector ID:

Date:

TASK D
Bridge B543

OVERALL SUBSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ______________________________

Substructure Elements	Rating	Remarks
Abutments	N 9 8 7 6 5 4 3 2 1 0	______
Piles	N 9 8 7 6 5 4 3 2 1 0	______
Footing	N 9 8 7 6 5 4 3 2 1 0	______
Stem	N 9 8 7 6 5 4 3 2 1 0	______
Bearing Seat	N 9 8 7 6 5 4 3 2 1 0	______
Backwall	N 9 8 7 6 5 4 3 2 1 0	______
Wingwalls	N 9 8 7 6 5 4 3 2 1 0	______
Piers and Bents	N 9 8 7 6 5 4 3 2 1 0	______
Piles	N 9 8 7 6 5 4 3 2 1 0	______
Footing	N 9 8 7 6 5 4 3 2 1 0	______
Columns/Stem	N 9 8 7 6 5 4 3 2 1 0	______
Cap	N 9 8 7 6 5 4 3 2 1 0	______
______	N 9 8 7 6 5 4 3 2 1 0	______
______	N 9 8 7 6 5 4 3 2 1 0	______

Scour/Undermining ______

Settlement ______

Substructure Protection ______

Collision Damage ______

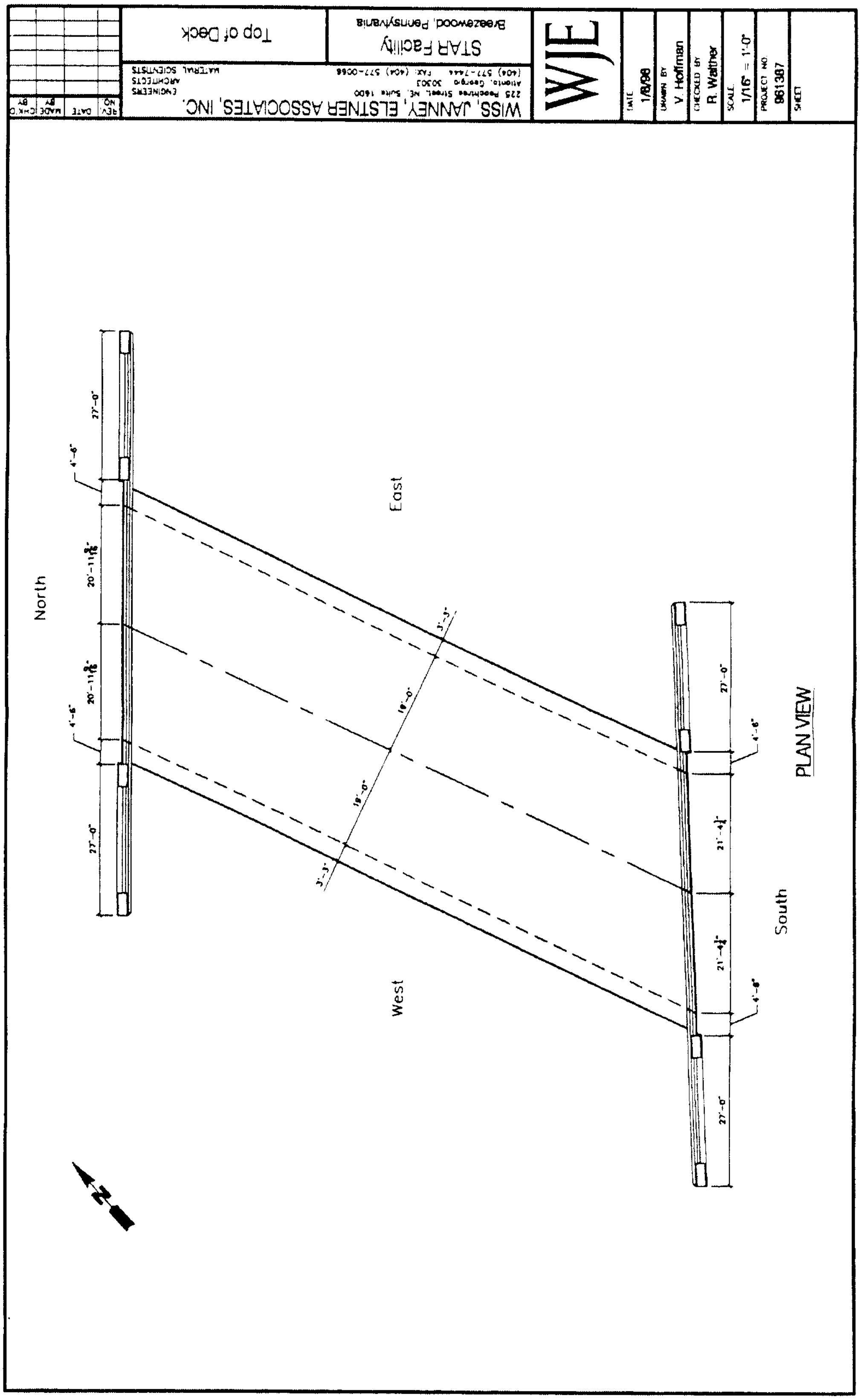
High-water Mark ______

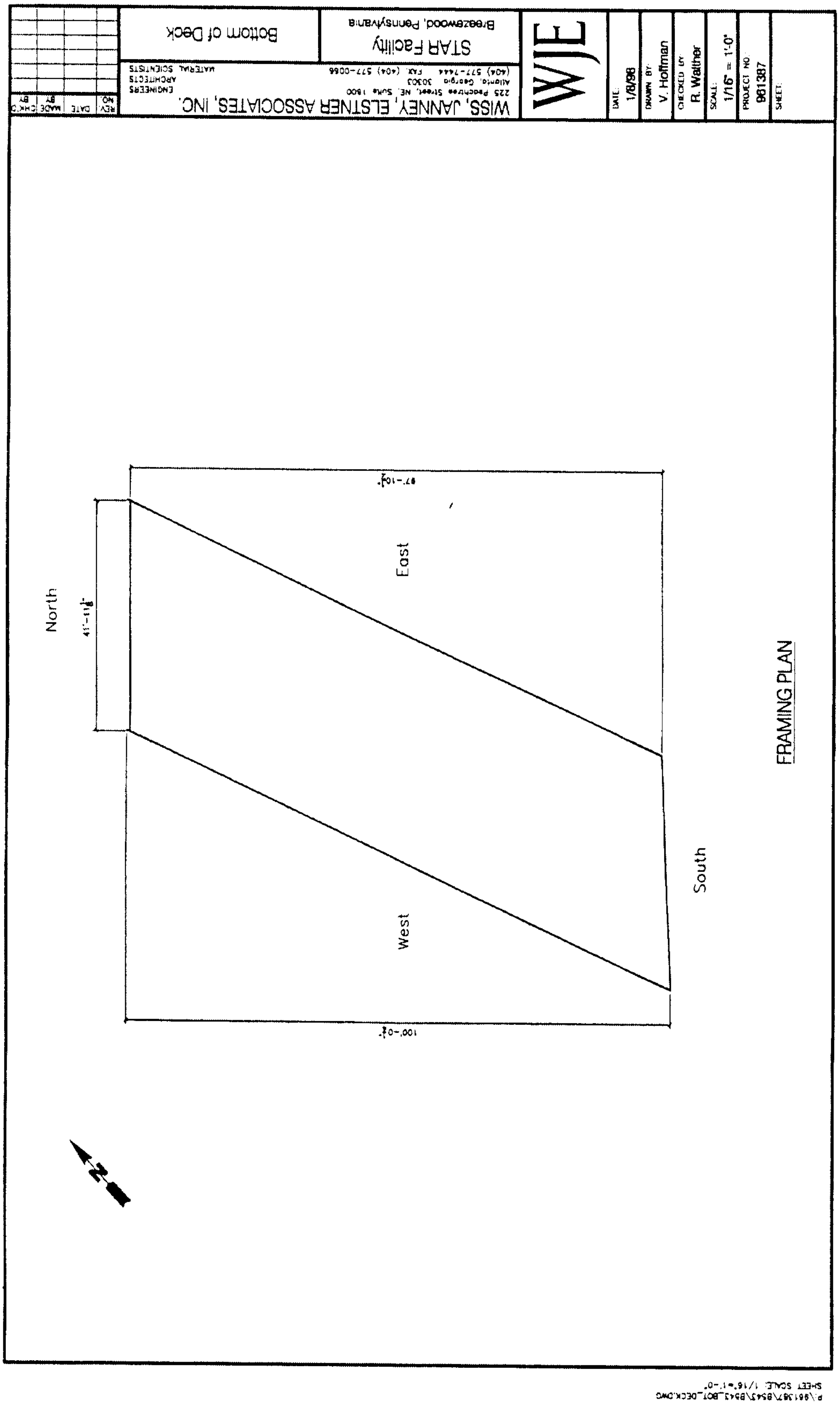
Concrete Deterioration ______

Steel Corrosion ______

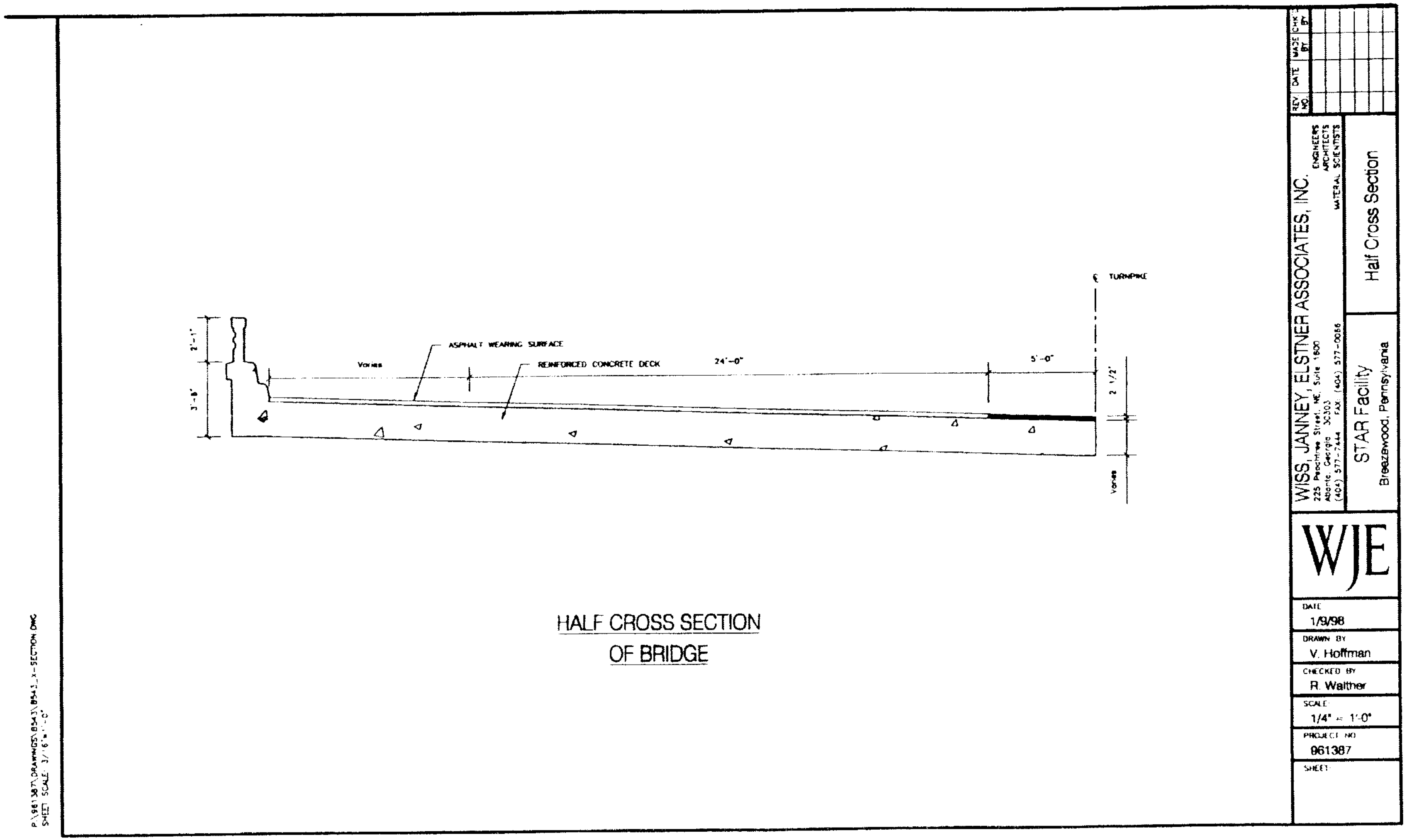
Paint ______

Notes: ______________________________

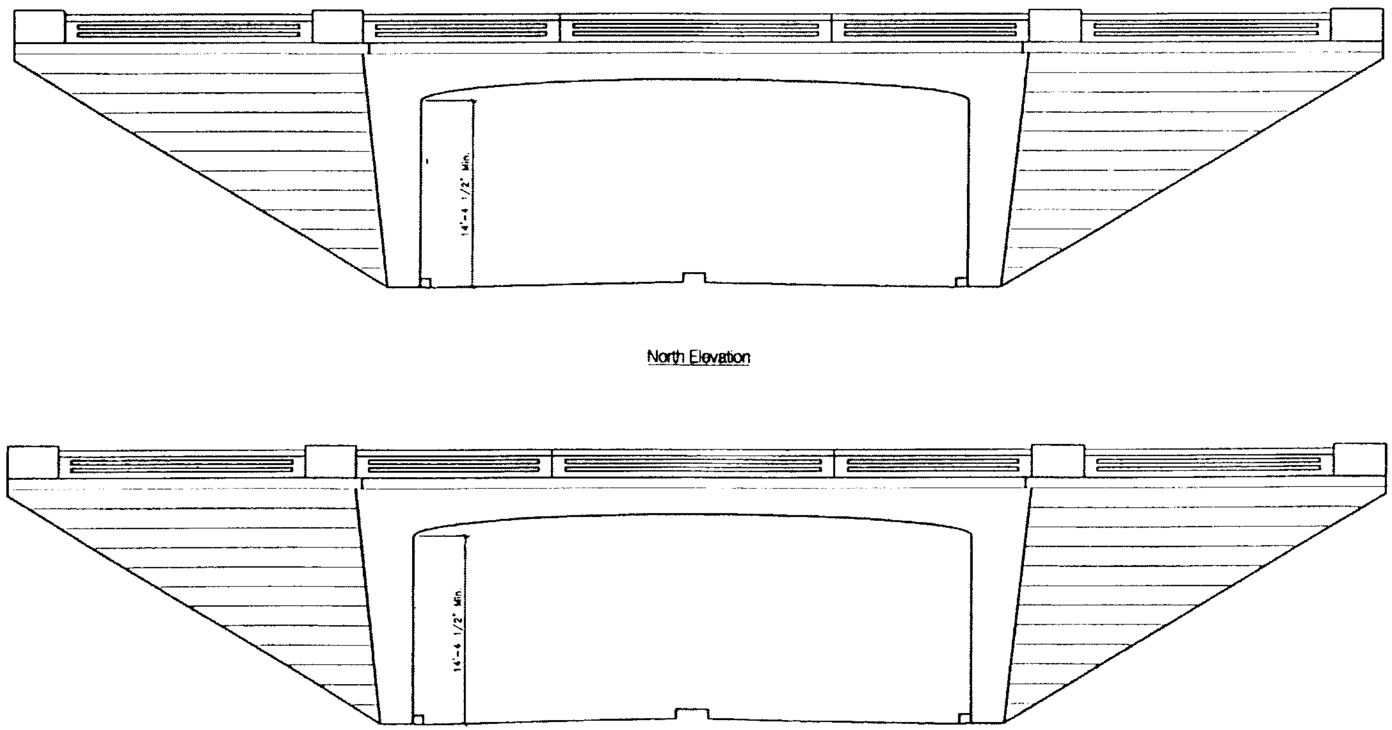

WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
Top of Deck
WJE
DATE 1/8/98
DRAWN BY V. Hoffman
CHECKED BY R. Walther
SCALE 1/16" = 1'-0"
PROJECT NO 981387
SHEET
North
East
West
South
PLAN VIEW
27'-0"
4'-6"
3'-3"
19'-0"
21'-4½"



P:\981387\B543\B543_BOT_DECK.DWG
SHEET SCALE: 1/16"=1'-0"



ASPHALT WEARING SURFACE
REINFORCED CONCRETE DECK
Varies
24'-0"
5'-0"
2 1/2"
2'-1"
3'-8"
℄ TURNPIKE
HALF CROSS SECTION
OF BRIDGE
WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX (404) 577-0086
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
Half Cross Section
WJE
DATE 1/9/98
DRAWN BY V. Hoffman
CHECKED BY R. Walther
SCALE 1/4" = 1'-0"
PROJECT NO 961387
SHEET
REV NO. DATE MADE BY CHK BY
P:\961387\DRAWINGS\B543\B543_X-SECTION.DWG
SHEET SCALE: 3/16"=1'-0"



North Elevation

South Elevation

ELEVATIONS

REV. NO.	DATE	MADE BY	CHK'D BY

WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX (404) 577-0086

ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS

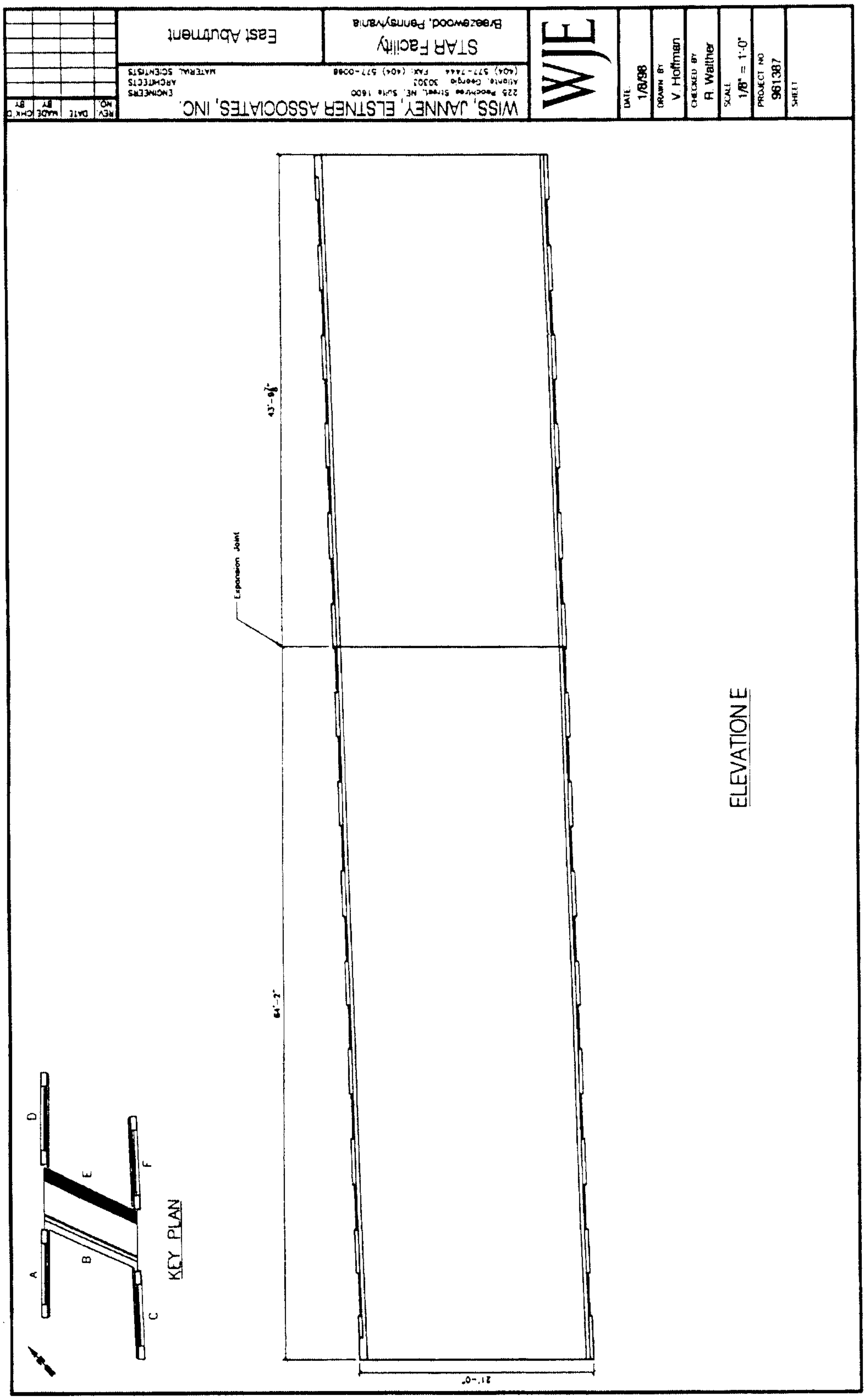
STAR Facility
Breezewood, Pennsylvania

Elevations

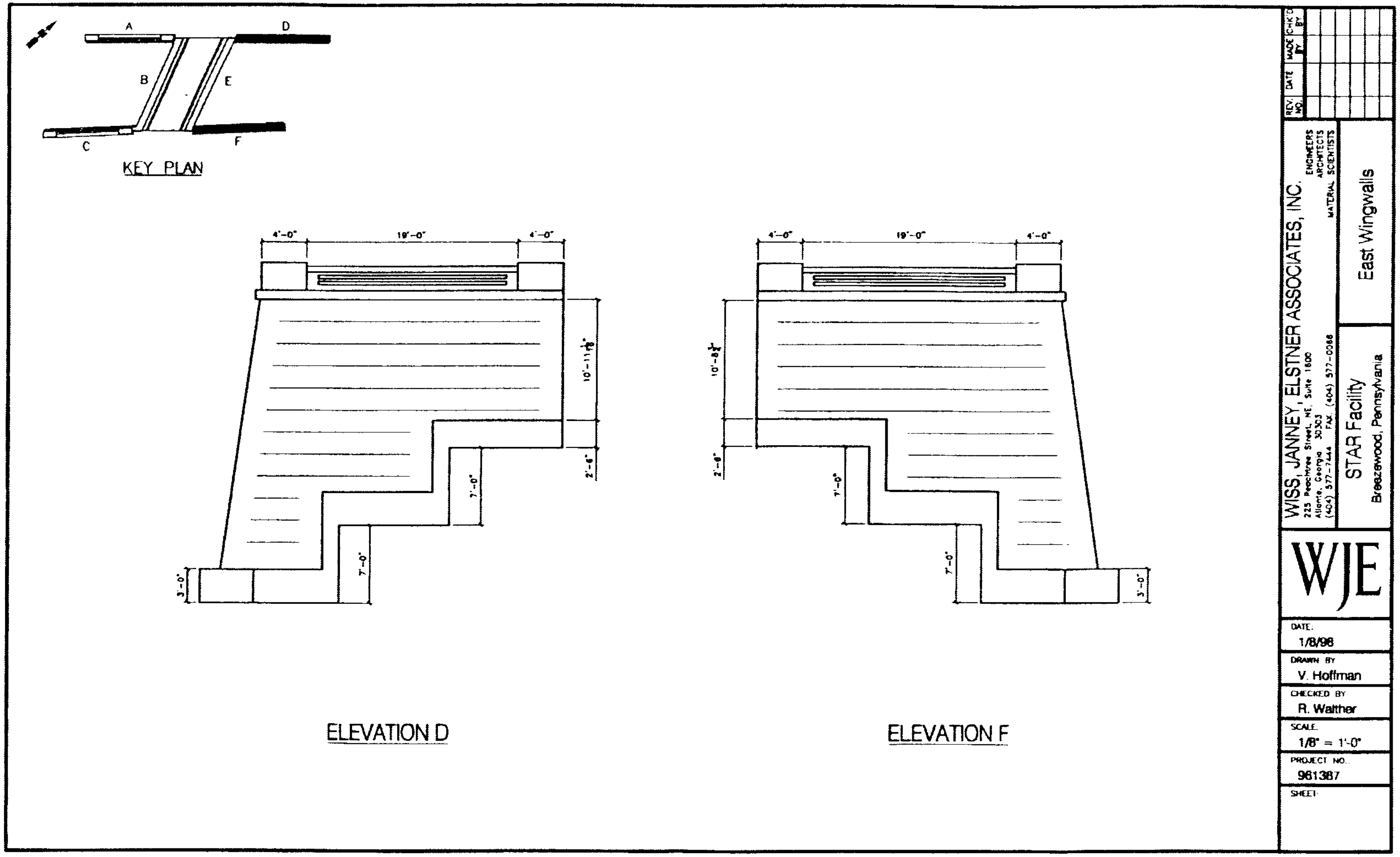
WJE

DATE	1/8/98
DRAWN BY:	V. Hoffman
CHECKED BY:	R. Walther
SCALE:	1/8" = 1'-0"
PROJECT NO.:	981387
SHEET:	

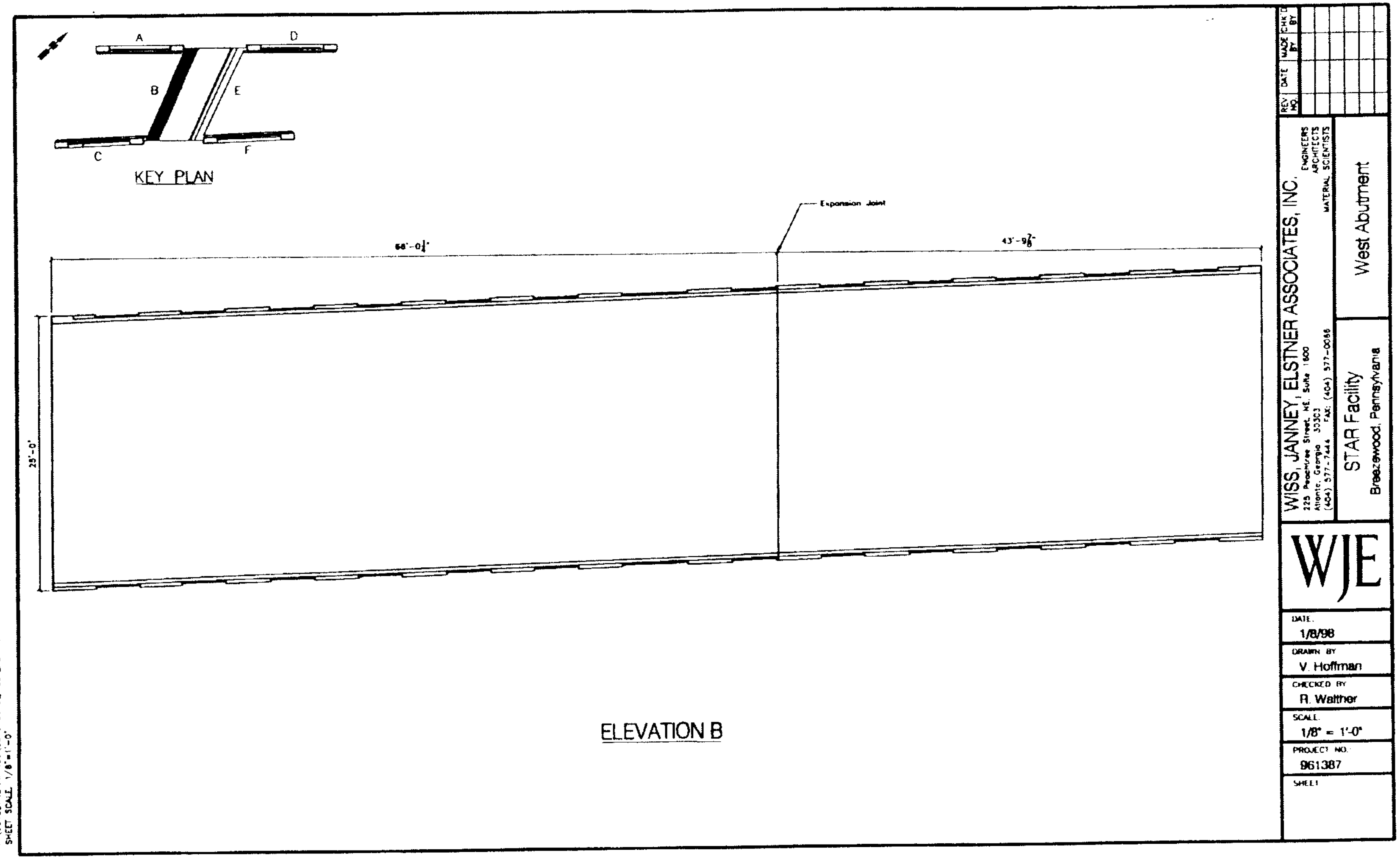
P:\981387\DRAWINGS\B543\B543_ELEVATIONS.DWG
SHEET SCALE: 1/8"=1'-0"

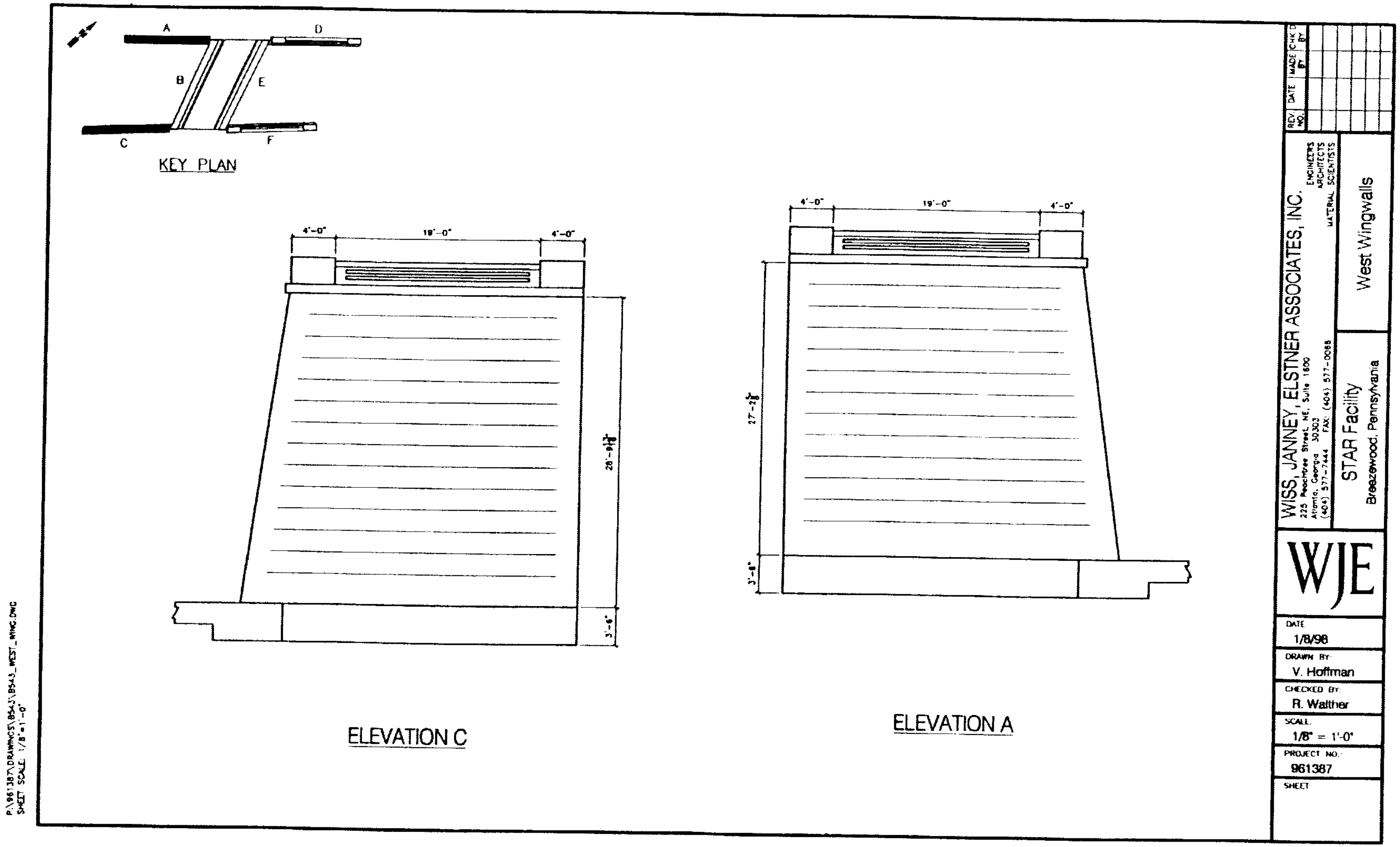


SHEET SCALE: 1/8"=1'-0"
P:\961387\DRAWINGS\B543\B543_EAST_ABUT.DWG



KEY PLAN
A
B
C
D
E
F
4'-0"
19'-0"
4'-0"
2'-6"
7'-0"
7'-0"
3'-0"
ELEVATION D
ELEVATION F
WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX (404) 577-0088
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
East Wingwalls
WJE
DATE: 1/8/98
DRAWN BY V. Hoffman
CHECKED BY R. Walther
SCALE 1/8" = 1'-0"
PROJECT NO. 981387
SHEET
REV. NO.
DATE
MADE BY
CHK'D BY
SHEET SCALE: 1/8"=1'-0"


KEY PLAN
A
B
C
D
E
F
Expansion Joint
68'-0 1/4"
43'-9 7/8"
25'-0"
ELEVATION B
REV NO.
DATE
MADE BY
CHK'D BY
WISS, JANNEY, ELSTNER ASSOCIATES, INC.
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX: (404) 577-0066
West Abutment
STAR Facility
Breezewood, Pennsylvania
WJE
DATE: 1/8/98
DRAWN BY V. Hoffman
CHECKED BY R. Walther
SCALE: 1/8" = 1'-0"
PROJECT NO: 961387
SHEET
SHEET SCALE 1/8"=1'-0"


KEY PLAN
A
B
C
D
E
F
4'-0"
19'-0"
4'-0"
28'-9 1/8"
3'-6"
ELEVATION C
27-2 3/8"
3'-6"
ELEVATION A
WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX: (404) 577-0088
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
West Wingwalls
WJE
DATE
1/8/98
DRAWN BY:
V. Hoffman
CHECKED BY:
R. Walther
SCALE
1/8" = 1'-0"
PROJECT NO.:
961387
SHEET
REV. NO.
DATE
MADE BY
CHK'D BY
P:\961387\DRAWINGS\B543\B543_WEST_WING.DWG
SHEET SCALE: 1/8"=1'-0"

Task E

Task E

Task E

Task E

Task E

Task E

Task E

Task E

Inspector ID:

Date:

Structure Type:

TASK E
Bridge B544

OVERALL DECK CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ____

Deck Elements	Rating	Remarks
Wearing Surface	N 9 8 7 6 5 4 3 2 1 0	
Deck – Topside	N 9 8 7 6 5 4 3 2 1 0	
Deck – Underside	N 9 8 7 6 5 4 3 2 1 0	
SIP Forms	N 9 8 7 6 5 4 3 2 1 0	
Curbs	N 9 8 7 6 5 4 3 2 1 0	
Medians	N 9 8 7 6 5 4 3 2 1 0	
Sidewalks	N 9 8 7 6 5 4 3 2 1 0	
Parapets	N 9 8 7 6 5 4 3 2 1 0	
Railing	N 9 8 7 6 5 4 3 2 1 0	
Expansion Joints	N 9 8 7 6 5 4 3 2 1 0	
Drainage System	N 9 8 7 6 5 4 3 2 1 0	
Lighting	N 9 8 7 6 5 4 3 2 1 0	
Utilities	N 9 8 7 6 5 4 3 2 1 0	
____________	N 9 8 7 6 5 4 3 2 1 0	
____________	N 9 8 7 6 5 4 3 2 1 0	

Notes: ____

Inspector ID:

Date:

TASK E
Bridge B544

OVERALL SUPERSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ____________________

Superstructure Elements	Rating	Remarks
Stringers	N 9 8 7 6 5 4 3 2 1 0	
Floorbeams	N 9 8 7 6 5 4 3 2 1 0	
Floor System Bracing	N 9 8 7 6 5 4 3 2 1 0	
Multibeams	N 9 8 7 6 5 4 3 2 1 0	
Girders	N 9 8 7 6 5 4 3 2 1 0	
Arches	N 9 8 7 6 5 4 3 2 1 0	
Cables	N 9 8 7 6 5 4 3 2 1 0	
Paint	N 9 8 7 6 5 4 3 2 1 0	
Bearing Devices	N 9 8 7 6 5 4 3 2 1 0	
Connections	N 9 8 7 6 5 4 3 2 1 0	
Welds	N 9 8 7 6 5 4 3 2 1 0	
________	N 9 8 7 6 5 4 3 2 1 0	
________	N 9 8 7 6 5 4 3 2 1 0	

Timber Decay ____________________

Concrete Deterioration ____________________

Steel Corrosion ____________________

Collision Damage ____________________

LL Deflection ____________________

Vibration ____________________

Member Alignment ____________________

Utilities ____________________

Notes: ____________________

Inspector ID:

Date:

TASK E
Bridge B544

OVERALL SUBSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ______________________________

Substructure Elements	Rating	Remarks
Abutments	N 9 8 7 6 5 4 3 2 1 0	________
Piles	N 9 8 7 6 5 4 3 2 1 0	________
Footing	N 9 8 7 6 5 4 3 2 1 0	________
Stem	N 9 8 7 6 5 4 3 2 1 0	________
Bearing Seat	N 9 8 7 6 5 4 3 2 1 0	________
Backwall	N 9 8 7 6 5 4 3 2 1 0	________
Wingwalls	N 9 8 7 6 5 4 3 2 1 0	________
Piers and Bents	N 9 8 7 6 5 4 3 2 1 0	________
Piles	N 9 8 7 6 5 4 3 2 1 0	________
Footing	N 9 8 7 6 5 4 3 2 1 0	________
Columns/Stem	N 9 8 7 6 5 4 3 2 1 0	________
Cap	N 9 8 7 6 5 4 3 2 1 0	________
________	N 9 8 7 6 5 4 3 2 1 0	________
________	N 9 8 7 6 5 4 3 2 1 0	________

Scour/Undermining ________

Settlement ________

Substructure Protection ________

Collision Damage ________

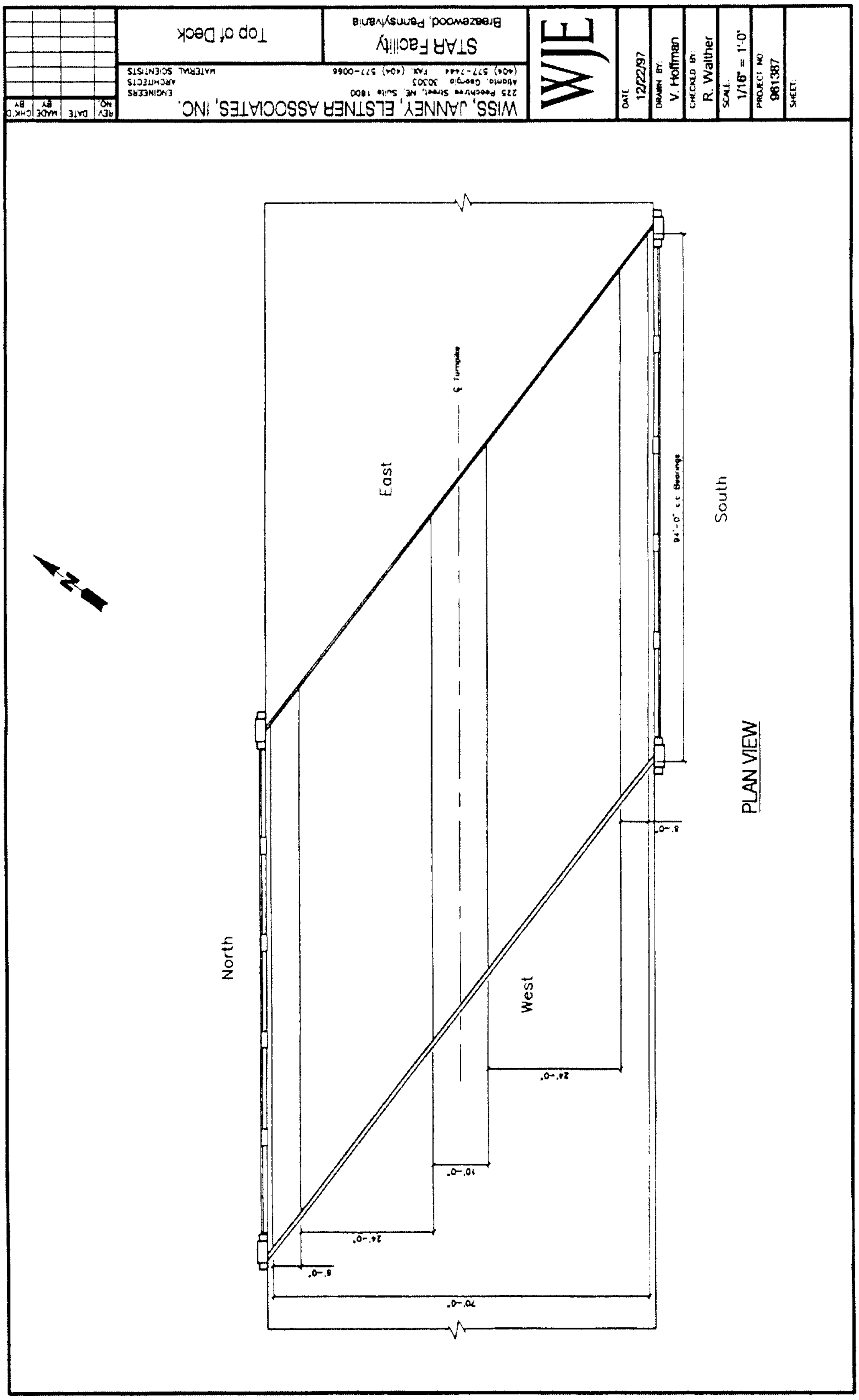
High-water Mark ________

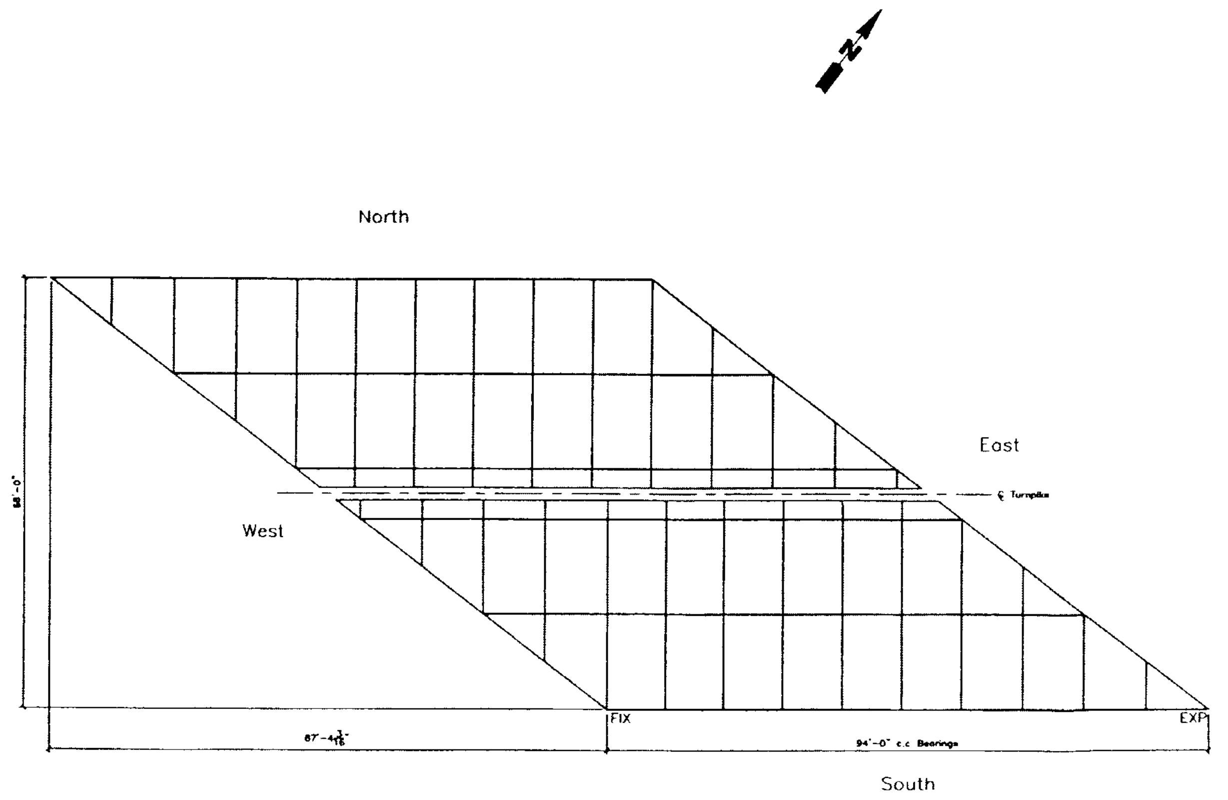
Concrete Deterioration ________

Steel Corrosion ________

Paint ________

Notes: ______________________________


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1800
Atlanta, Georgia 30303
(404) 577-7444 FAX (404) 577-0066
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
Top of Deck
WJE
DATE 12/22/97
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/16" = 1'-0"
PROJECT NO 981387
SHEET:
East
West
North
South
N
℄ Turnpike
94'-0" c.c. Bearings
8'-0"
24'-0"
10'-0"
24'-0"
8'-0"
70'-0"
PLAN VIEW



FRAMING PLAN

WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX: (404) 577-0086
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS

STAR Facility
Breezewood, Pennsylvania

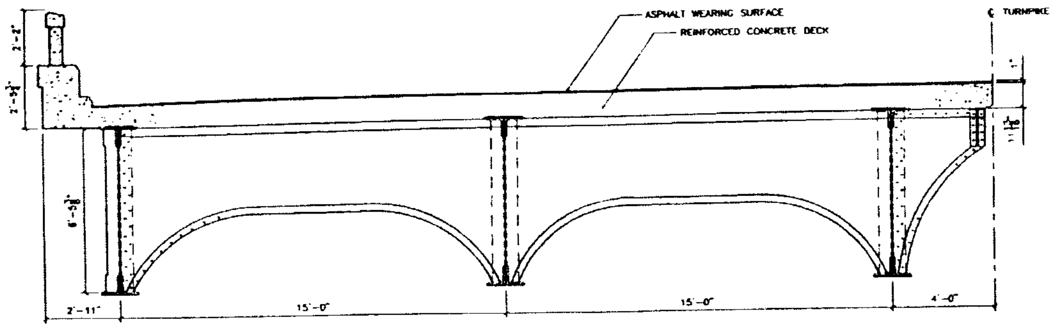
Botton of Deck

WJE

REV. NO.	DATE	MADE BY	CHK'D BY

DATE: 12/22/97
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/16" = 1'-0"
PROJECT NO.: 961387
SHEET:

P:\961387\DRAWINGS\B544\B544_BOT_DECK.DWG
SHEET SCALE: 1/16"=1'-0"



HALF CROSS SECTION
OF BRIDGE

REV. NO.	DATE	MADE BY	CHK'D BY

WISS, JANNEY, ELSTNER ASSOCIATES, INC.
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX: (404) 577-0086

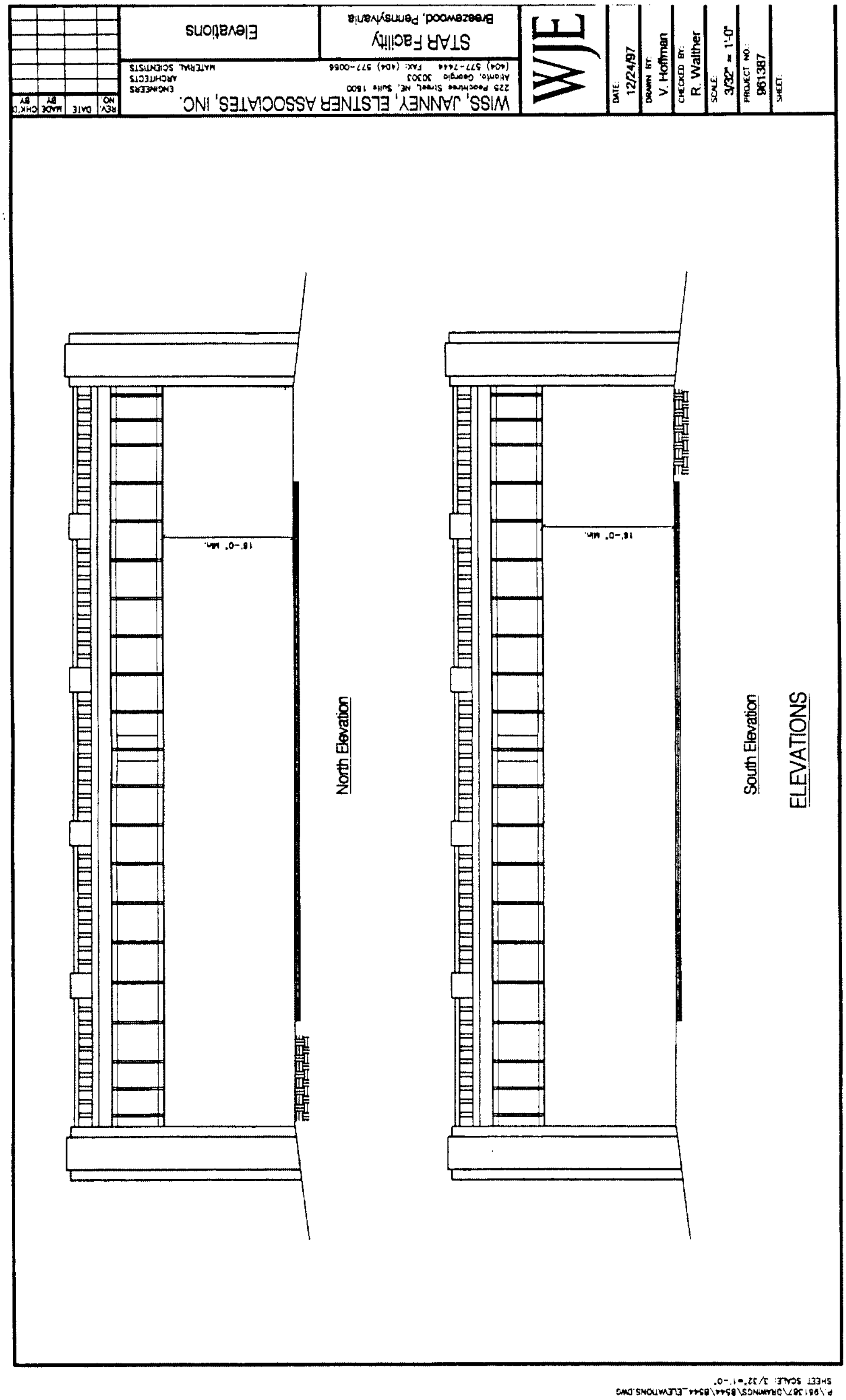
Half Cross Section

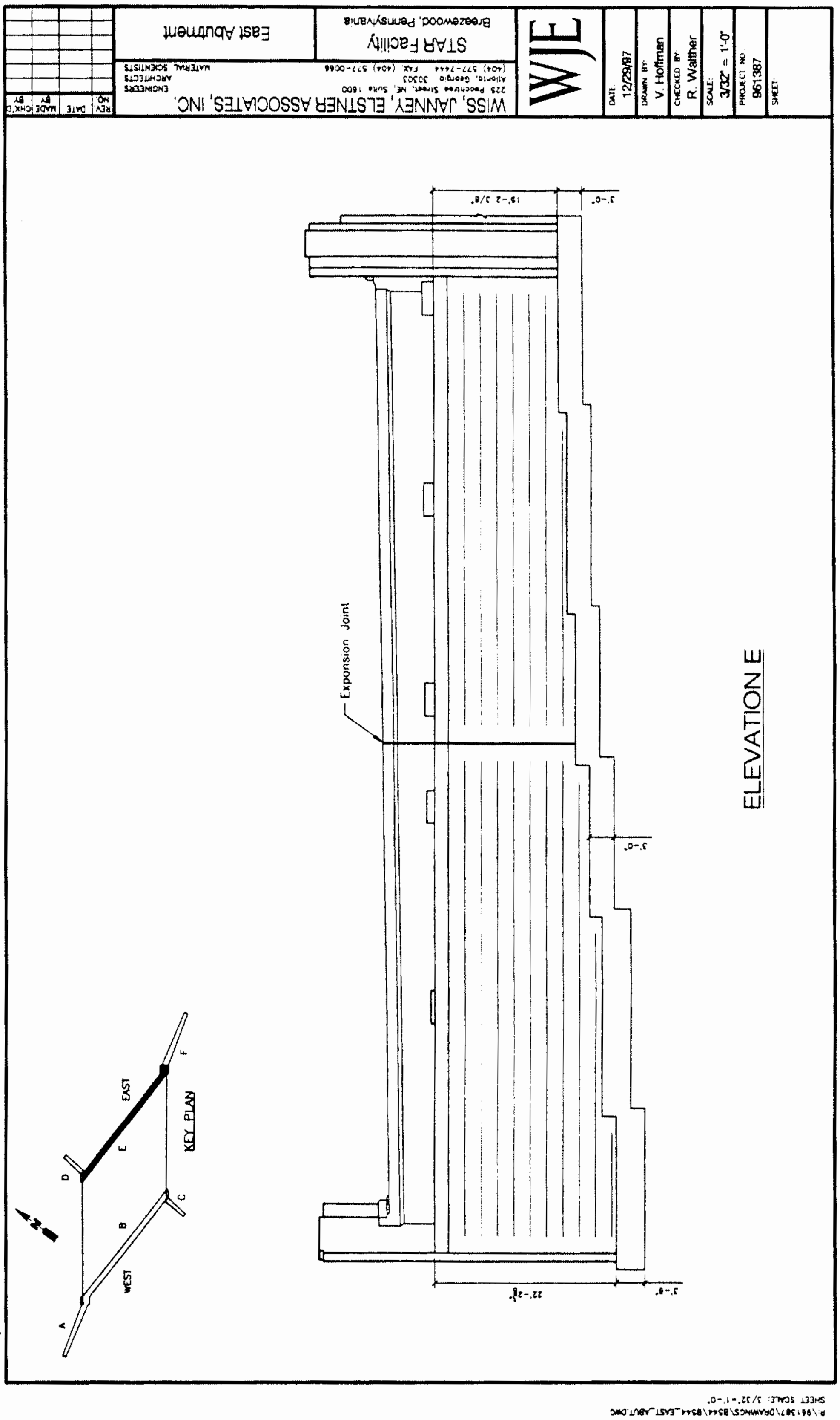
STAR Facility
Breezewood, Pennsylvania

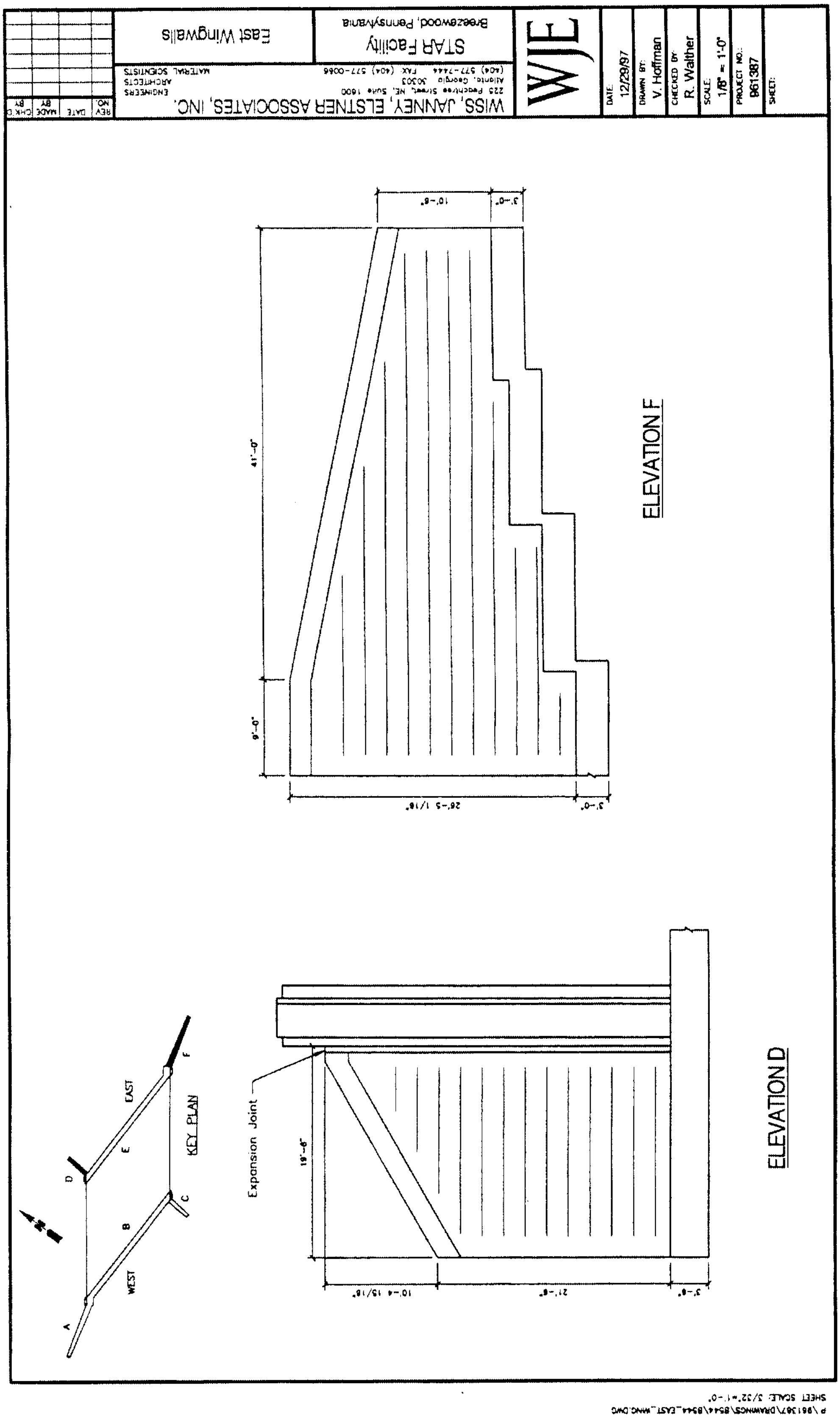
WJE

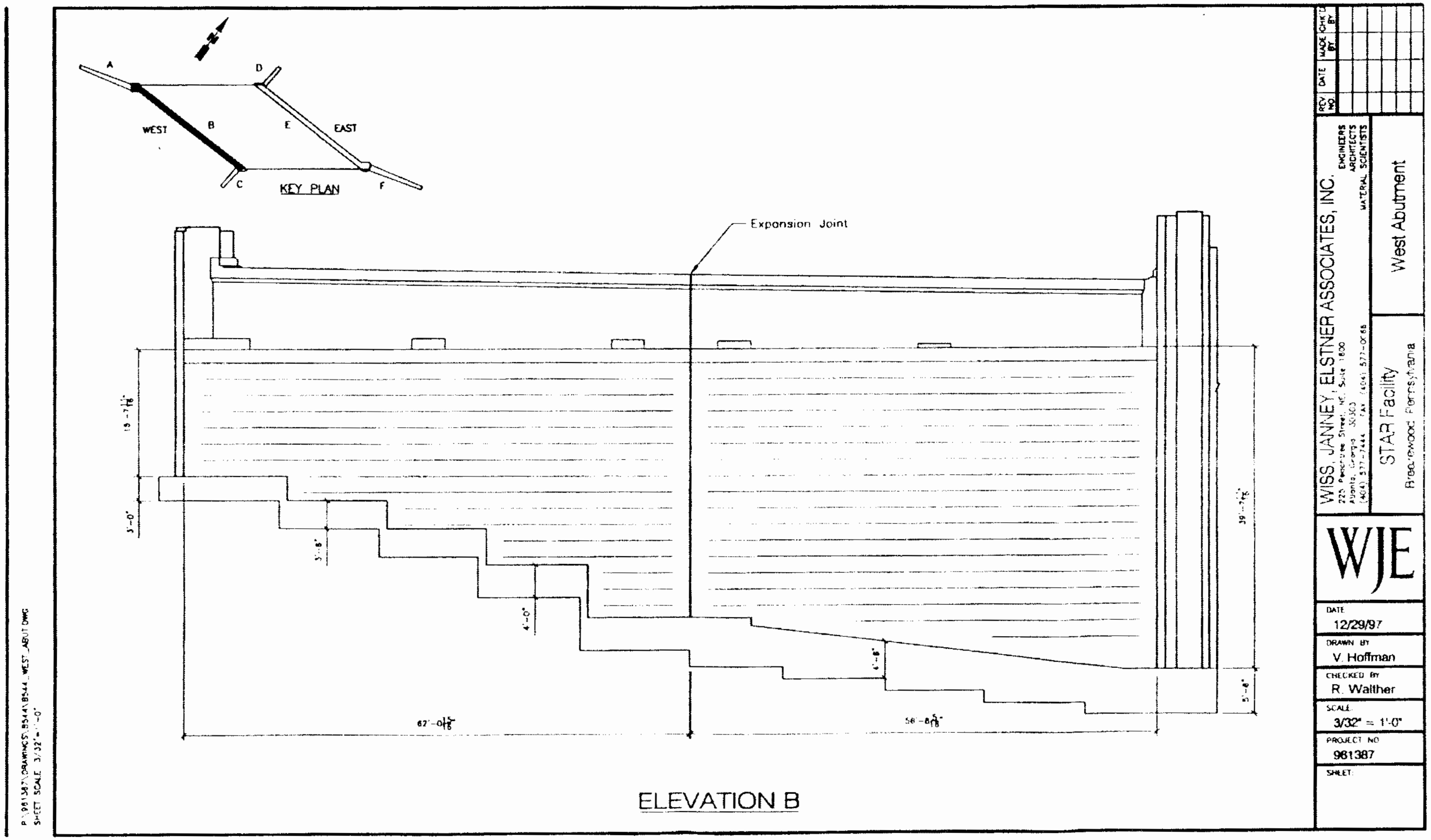
DATE:
12/18/97
DRAWN BY:
V. Hoffman
CHECKED BY:
R. Walther
SCALE:
1/4" = 1'-0"
PROJECT NO:
981387
SHEET:

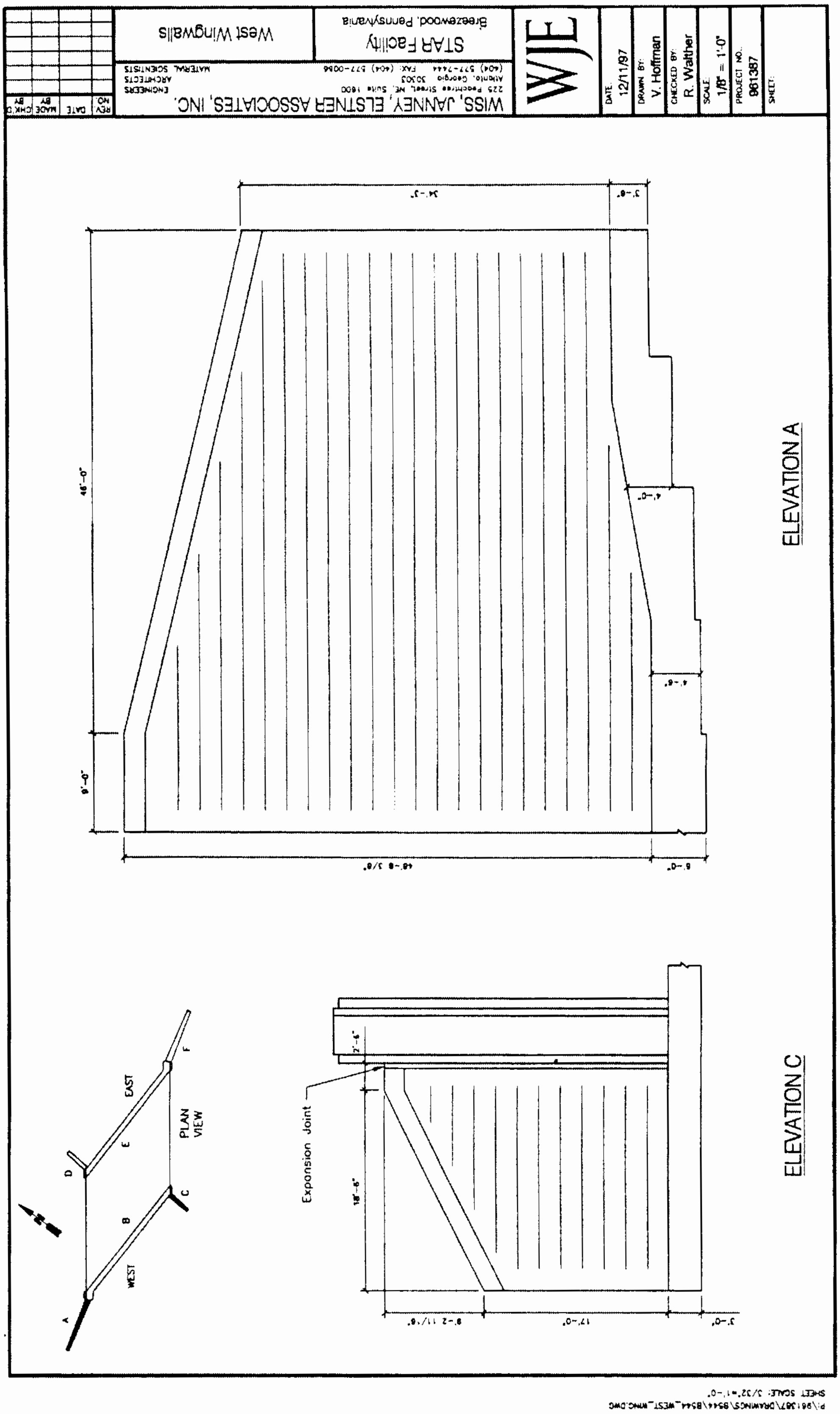
P:\981387\DRAWINGS\B544\B544_X-SECTION.DWG
SHEET SCALE: 1/4"=1'-0"


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
225 Peachtree Street, NE, Suite 1800
Atlanta, Georgia 30303
(404) 577-7444 FAX: (404) 577-0066
STAR Facility
Breezewood, Pennsylvania
Elevations
WJE
DATE: 12/24/97
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 3/32" = 1'-0"
PROJECT NO.: 961387
SHEET:
NO. REV. DATE MADE BY CHK'D BY
18'-0" Min.
North Elevation
18'-0" Min.
South Elevation
ELEVATIONS
SHEET SCALE: 3/32"=1'-0"
P:\961387\DRAWINGS\B544\B544_ELEVATIONS.DWG


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX (404) 577-0066
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
East Abutment
WJE
DATE 12/29/87
DRAWN BY: V. Hoffman
CHECKED BY R. Walther
SCALE: 3/32" = 1'-0"
PROJECT NO 961387
SHEET:
REV NO
DATE
MADE BY
CHK'D BY
19'-2 3/8"
3'-0"
Expansion Joint
22'-2½"
3'-6"
ELEVATION E
EAST
WEST
A
B
C
D
E
F
KEY PLAN
SHEET SCALE: 3/32"=1'-0"
P:\961387\DRAWINGS\B544\B544_EAST_ABUT.DWG


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
STAR Facility
Breezewood, Pennsylvania
East Wingwalls
WJE
DATE: 12/29/97
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/8" = 1'-0"
PROJECT NO.: 961387
SHEET:
ELEVATION F
10'-6"
3'-0"
41'-0"
9'-0"
26'-5 1/16"
ELEVATION D
Expansion Joint
19'-6"
10'-4 15/16"
21'-6"
3'-6"
KEY PLAN
EAST
WEST
A
B
C
D
E
F


KEY PLAN
A
B
C
D
E
F
WEST
EAST
Exponsion Joint
5'-0"
5'-8"
4'-0"
4'-8"
5'-8"
ELEVATION B
WISS, JANNEY, ELSTNER ASSOCIATES, INC.
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
West Abutment
STAR Facility
Brentwood, Pennsylvania
WJE
DATE
12/29/97
DRAWN BY
V. Hoffman
CHECKED BY
R. Walther
SCALE
3/32" = 1'-0"
PROJECT NO
981387
SHEET
REV NO
DATE
MADE BY
CHK'D BY
SHEET SCALE 3/32" = 1'-0"


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
STAR Facility
Breezewood, Pennsylvania
West Wingwalls
WJE
DATE: 12/11/97
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/8" = 1'-0"
PROJECT NO.: 961387
ELEVATION A
ELEVATION C
Expansion Joint
PLAN VIEW
EAST
WEST

Task F

Task F

Task F

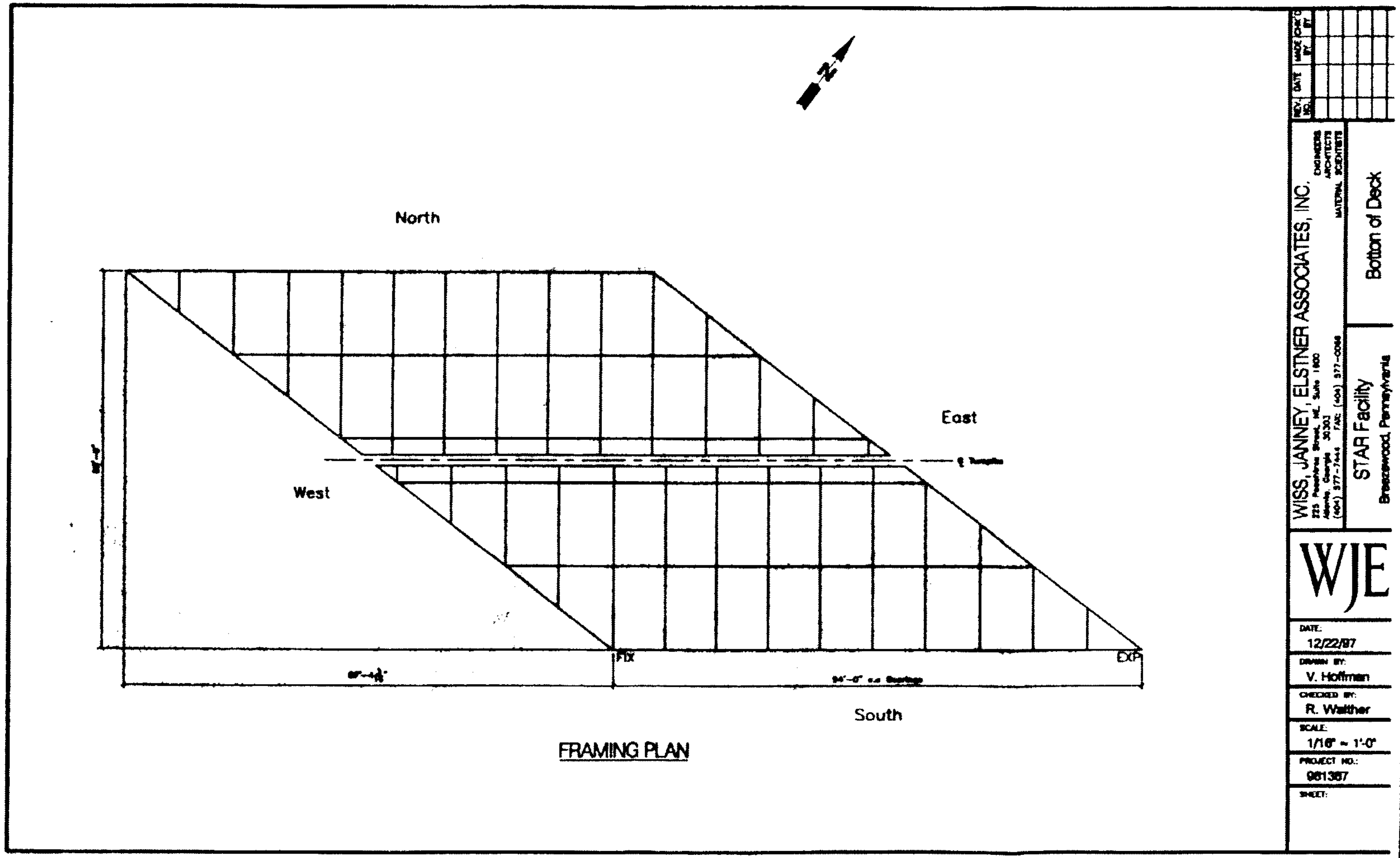
Task F

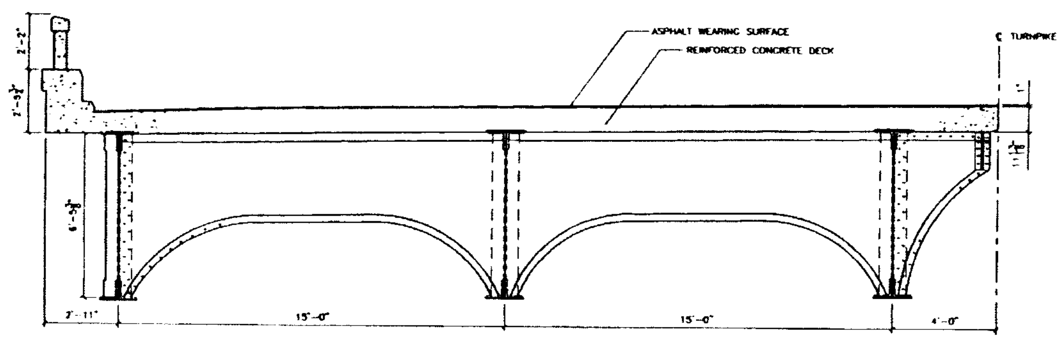
Task F

Task F

Task F

Task F


N
North
East
West
South
FIX
EXP
FRAMING PLAN
WISS, JANNEY, ELSTNER ASSOCIATES, INC.
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
Bottom of Deck
WJE
DATE:
12/22/97
DRAWN BY:
V. Hoffman
CHECKED BY:
R. Walther
SCALE:
1/16" = 1'-0"
PROJECT NO.:
981387
SHEET:
REV. NO.
DATE
MADE BY
CHKD BY



HALF CROSS SECTION
OF BRIDGE

P:\981387\DRAWINGS\B544\B544_X-SECTION.DWG
SHEET SCALE: 1/4"=1'-0"

REV. NO.	DATE	MADE BY	CHK'D BY

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225 Peachtree Street, NE, Suite 1600
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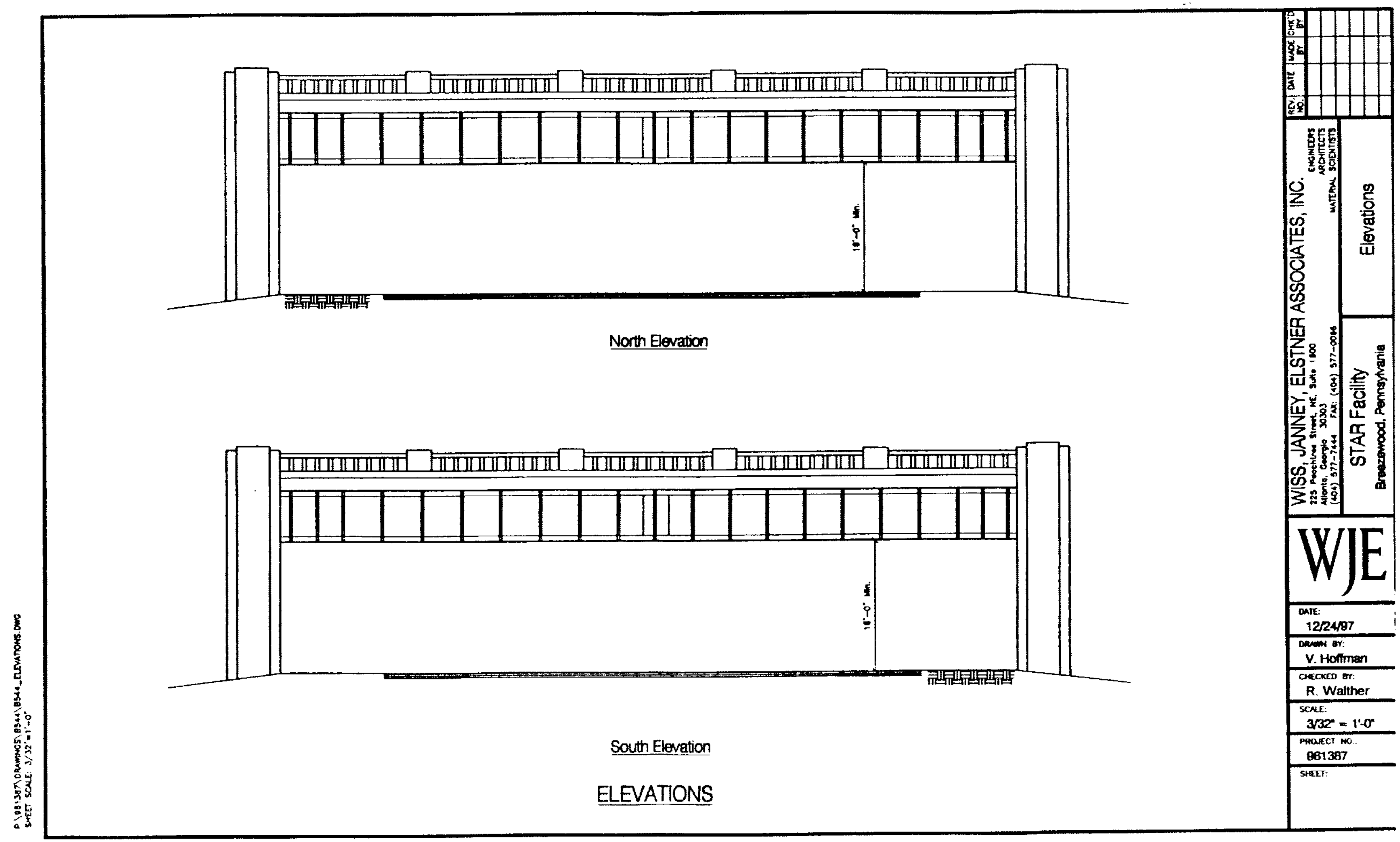
(404) 577-7444 FAX. (404) 577-0086
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS

STAR Facility
Breezewood, Pennsylvania

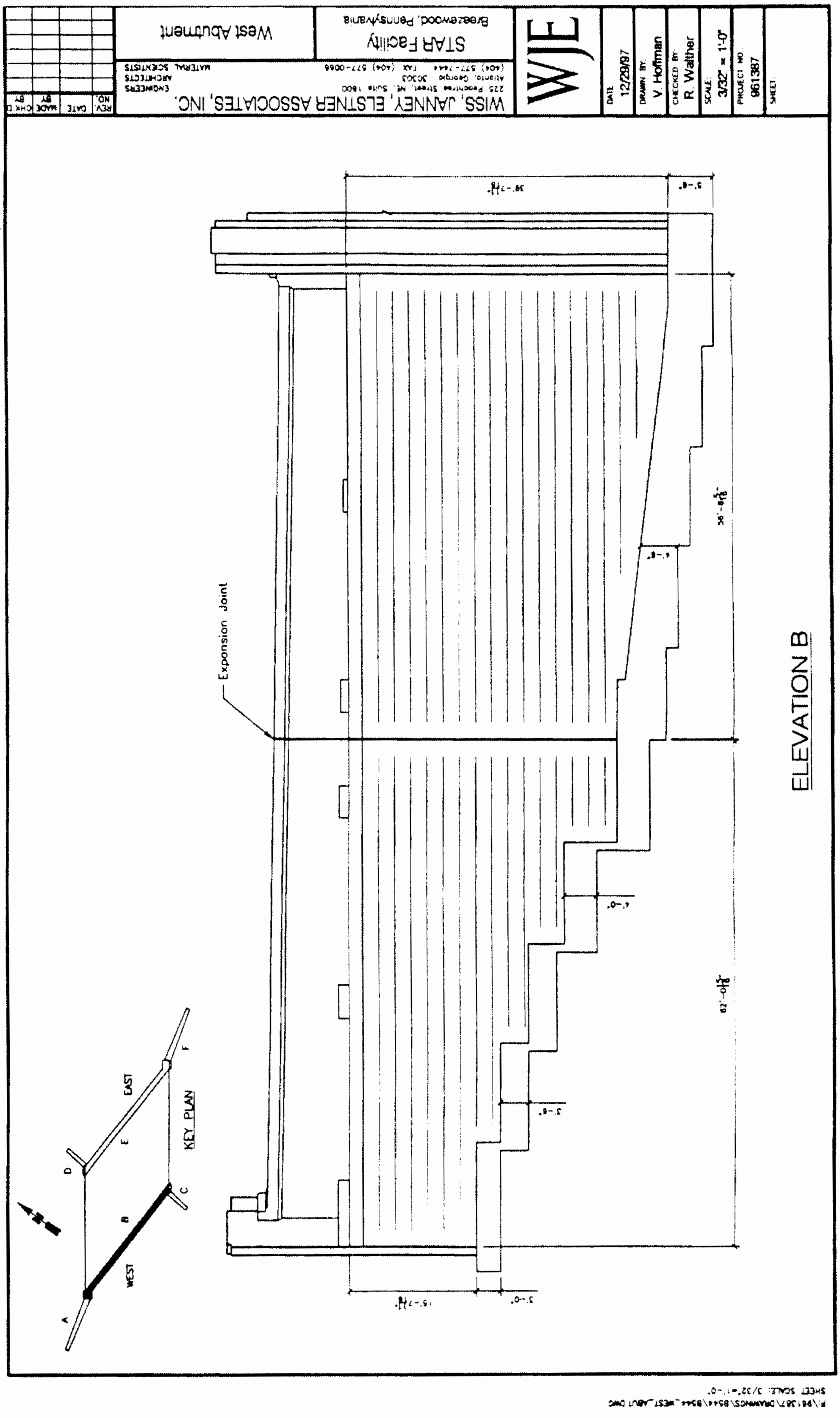
Half Cross Section

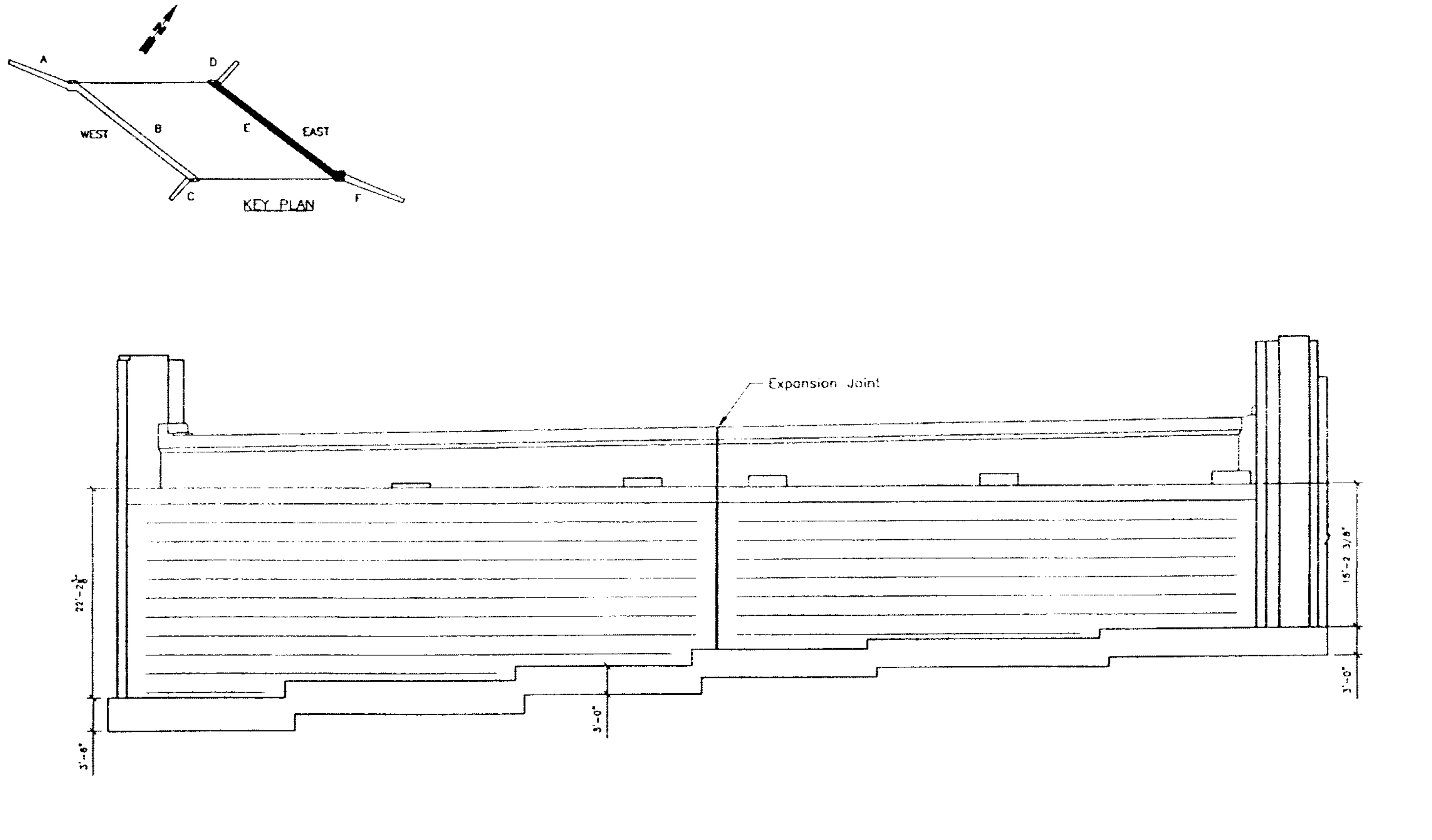
WJE

DATE: 12/18/97
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 1/4" = 1'-0"
PROJECT NO.: 981387
SHEET:



16'-0" Min.
North Elevation
16'-0" Min.
South Elevation
ELEVATIONS
P:\981387\DRAWINGS\B544\B544_ELEVATIONS.DWG
SHEET SCALE: 3/32"=1'-0"
REV. NO.
DATE
MADE BY
CHK'D BY
WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1800
Atlanta, Georgia 30303
(404) 577-7444 FAX: (404) 577-0086
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
Elevations
STAR Facility
Breezewood, Pennsylvania
WJE
DATE:
12/24/97
DRAWN BY:
V. Hoffman
CHECKED BY:
R. Walther
SCALE:
3/32" = 1'-0"
PROJECT NO.
981387
SHEET:


WISS, JANNEY, ELSTNER ASSOCIATES, INC.
ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS
STAR Facility
Breezewood, Pennsylvania
West Abutment
WJE
DATE: 12/29/97
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 3/32" = 1'-0"
PROJECT NO. 961387
SHEET:
Expansion Joint
ELEVATION B
KEY PLAN
EAST
WEST



ELEVATION E

REV. NO.	DATE	MADE BY	CHK'D BY

WISS, JANNEY, ELSTNER ASSOCIATES, INC.
225 Peachtree Street, NE, Suite 1600
Atlanta, Georgia 30303
(404) 577-7444 FAX (404) 577-0086

ENGINEERS
ARCHITECTS
MATERIAL SCIENTISTS

East Abutment

STAR Facility
Breezewood, Pennsylvania

WJE

DATE: 12/29/97
DRAWN BY: V. Hoffman
CHECKED BY: R. Walther
SCALE: 3/32" = 1'-0"
PROJECT NO.: 961387
SHEET:

P:\961387\DRAWINGS\B544\B544_EAST_ABUT.DWG
SHEET SCALE: 3/32"=1'-0"

Task G

Task G

Task G

Task G

Task G

Task G

Task G

Task G

Inspector ID:

Date:

Structure Type:

TASK G
Route 1 Bridge

OVERALL DECK CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ______________________________

Deck Elements	Rating	Remarks
Wearing Surface	N 9 8 7 6 5 4 3 2 1 0	
Deck – Topside	N 9 8 7 6 5 4 3 2 1 0	
Deck – Underside	N 9 8 7 6 5 4 3 2 1 0	
SIP Forms	N 9 8 7 6 5 4 3 2 1 0	
Curbs	N 9 8 7 6 5 4 3 2 1 0	
Medians	N 9 8 7 6 5 4 3 2 1 0	
Sidewalks	N 9 8 7 6 5 4 3 2 1 0	
Parapets	N 9 8 7 6 5 4 3 2 1 0	
Railing	N 9 8 7 6 5 4 3 2 1 0	
Expansion Joints	N 9 8 7 6 5 4 3 2 1 0	
Drainage System	N 9 8 7 6 5 4 3 2 1 0	
Lighting	N 9 8 7 6 5 4 3 2 1 0	
Utilities	N 9 8 7 6 5 4 3 2 1 0	
________	N 9 8 7 6 5 4 3 2 1 0	
________	N 9 8 7 6 5 4 3 2 1 0	

Notes: ______________________________

Inspector ID:

Date:

TASK G
Route 1 Bridge

OVERALL SUPERSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ____________________

Superstructure Elements	Rating	Remarks
Stringers	N 9 8 7 6 5 4 3 2 1 0	
Floorbeams	N 9 8 7 6 5 4 3 2 1 0	
Floor System Bracing	N 9 8 7 6 5 4 3 2 1 0	
Multibeams	N 9 8 7 6 5 4 3 2 1 0	
Girders	N 9 8 7 6 5 4 3 2 1 0	
Arches	N 9 8 7 6 5 4 3 2 1 0	
Cables	N 9 8 7 6 5 4 3 2 1 0	
Paint	N 9 8 7 6 5 4 3 2 1 0	
Bearing Devices	N 9 8 7 6 5 4 3 2 1 0	
Connections	N 9 8 7 6 5 4 3 2 1 0	
Welds	N 9 8 7 6 5 4 3 2 1 0	
________	N 9 8 7 6 5 4 3 2 1 0	
________	N 9 8 7 6 5 4 3 2 1 0	

Timber Decay ____________________

Concrete Deterioration ____________________

Steel Corrosion ____________________

Collision Damage ____________________

LL Deflection ____________________

Vibration ____________________

Member Alignment ____________________

Utilities ____________________

Notes: ____________________

Inspector ID:

Date:

TASK G
Route 1 Bridge

OVERALL SUBSTRUCTURE CONDITION RATING: N 9 8 7 6 5 4 3 2 1 0

Comments: ______________________________

Substructure Elements	Rating											Remarks
Abutments	N	9	8	7	6	5	4	3	2	1	0	
Piles	N	9	8	7	6	5	4	3	2	1	0	
Footing	N	9	8	7	6	5	4	3	2	1	0	
Stem	N	9	8	7	6	5	4	3	2	1	0	
Bearing Seat	N	9	8	7	6	5	4	3	2	1	0	
Backwall	N	9	8	7	6	5	4	3	2	1	0	
Wingwalls	N	9	8	7	6	5	4	3	2	1	0	
Piers and Bents	N	9	8	7	6	5	4	3	2	1	0	
Piles	N	9	8	7	6	5	4	3	2	1	0	
Footing	N	9	8	7	6	5	4	3	2	1	0	
Columns/Stem	N	9	8	7	6	5	4	3	2	1	0	
Cap	N	9	8	7	6	5	4	3	2	1	0	
________	N	9	8	7	6	5	4	3	2	1	0	
________	N	9	8	7	6	5	4	3	2	1	0	

Scour/Undermining ______________________________

Settlement ______________________________

Substructure Protection ______________________________

Collision Damage ______________________________

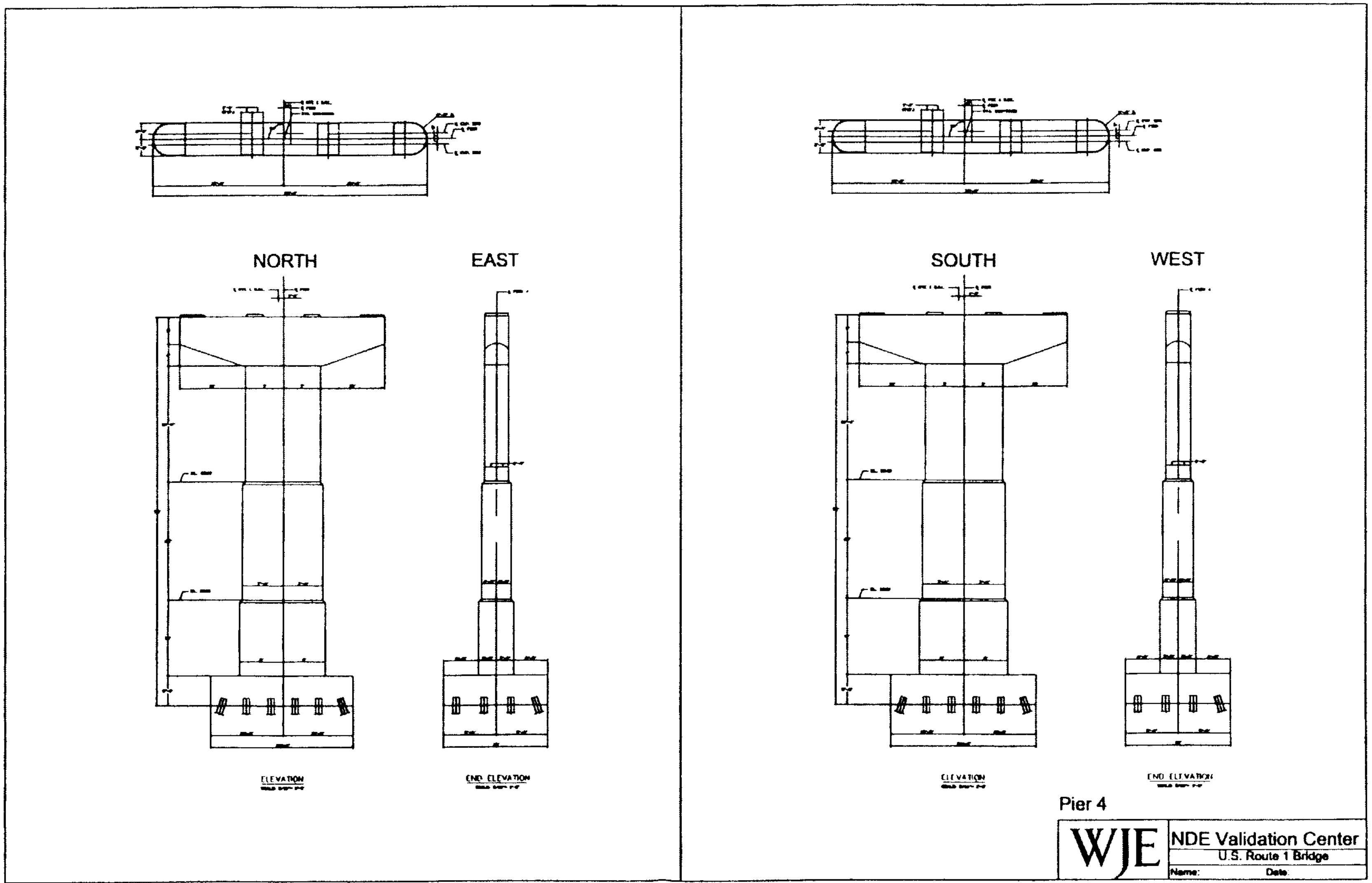
High-water Mark ______________________________

Concrete Deterioration ______________________________

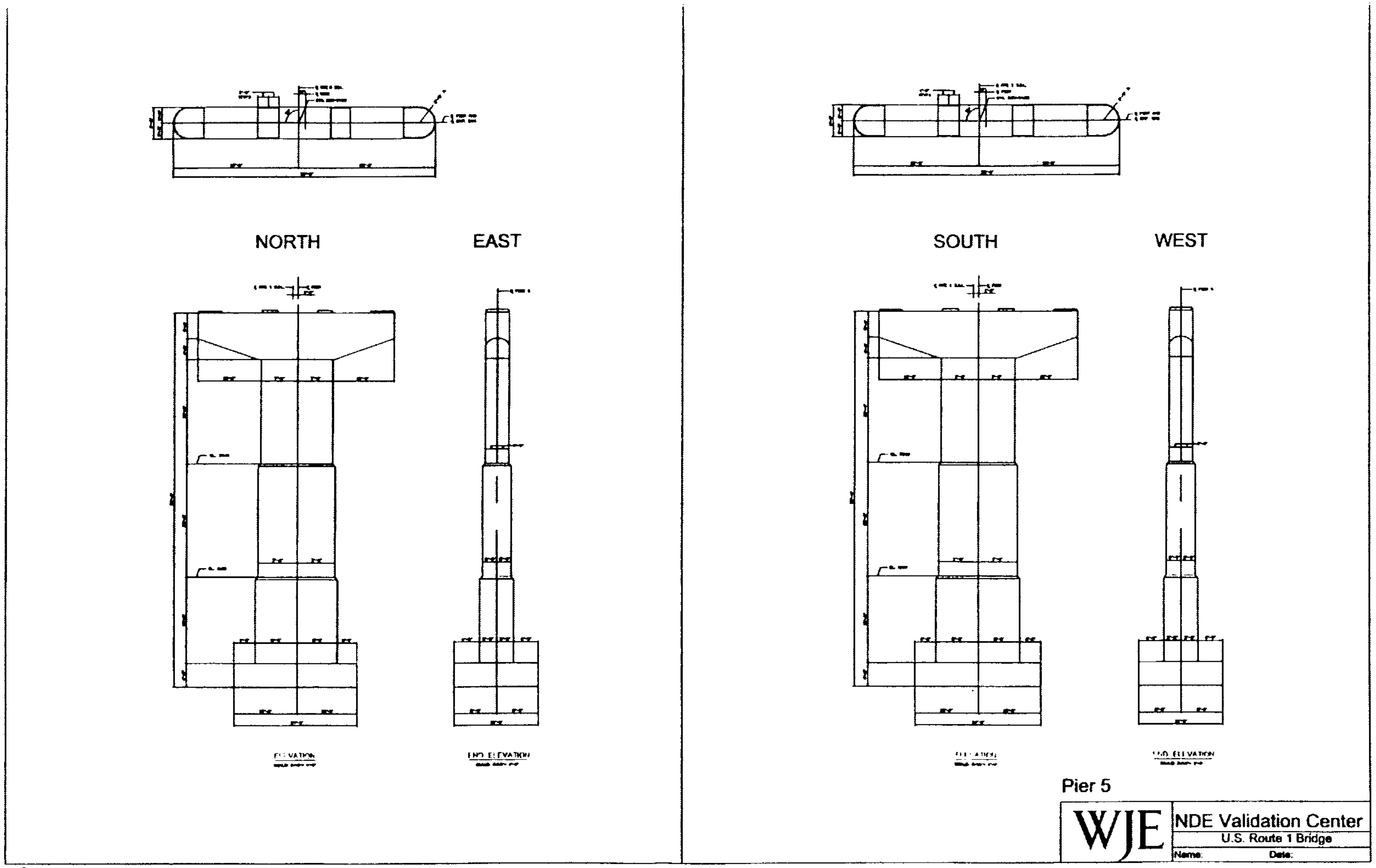
Steel Corrosion ______________________________

Paint ______________________________

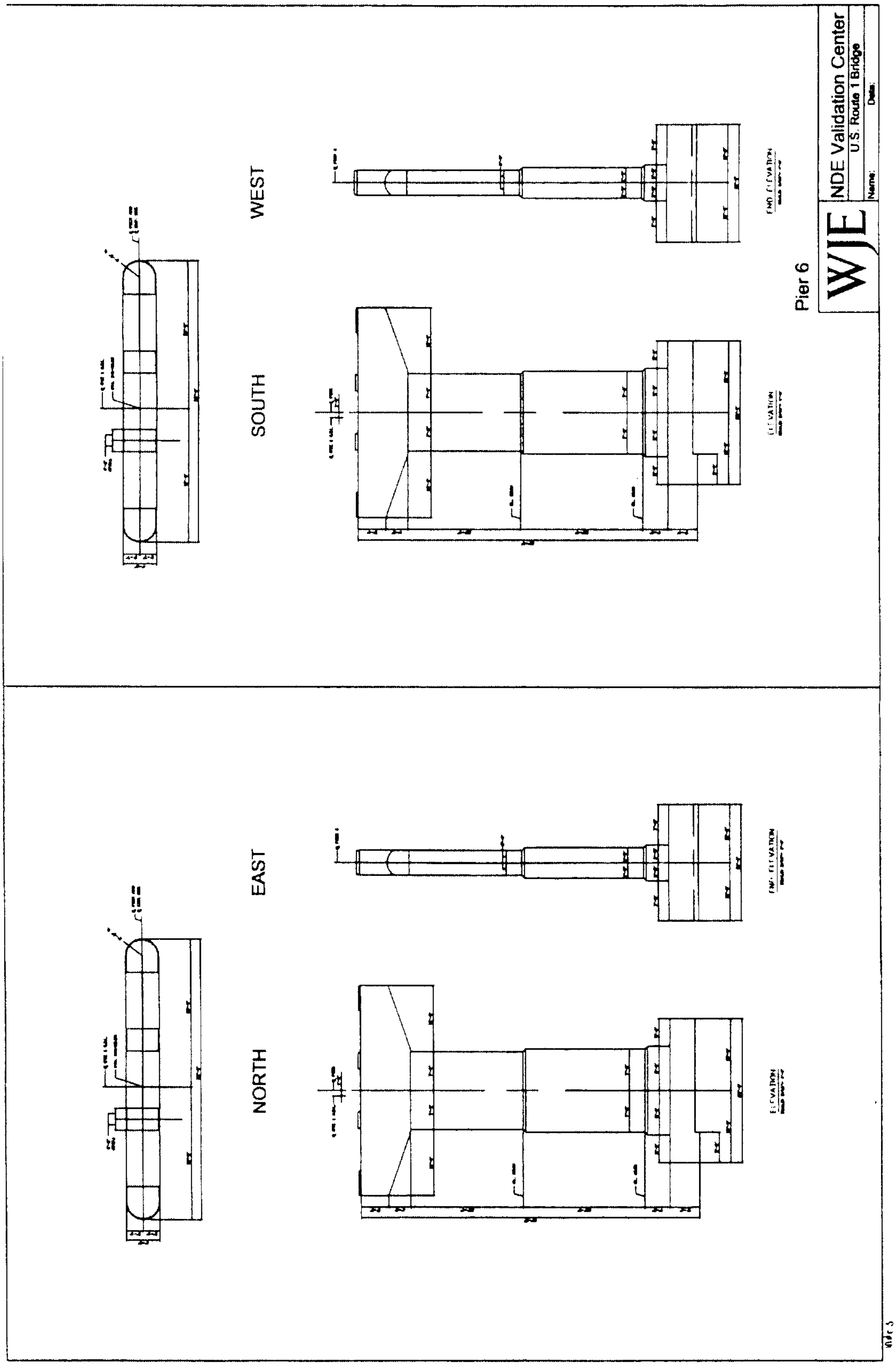
Notes: ______________________________



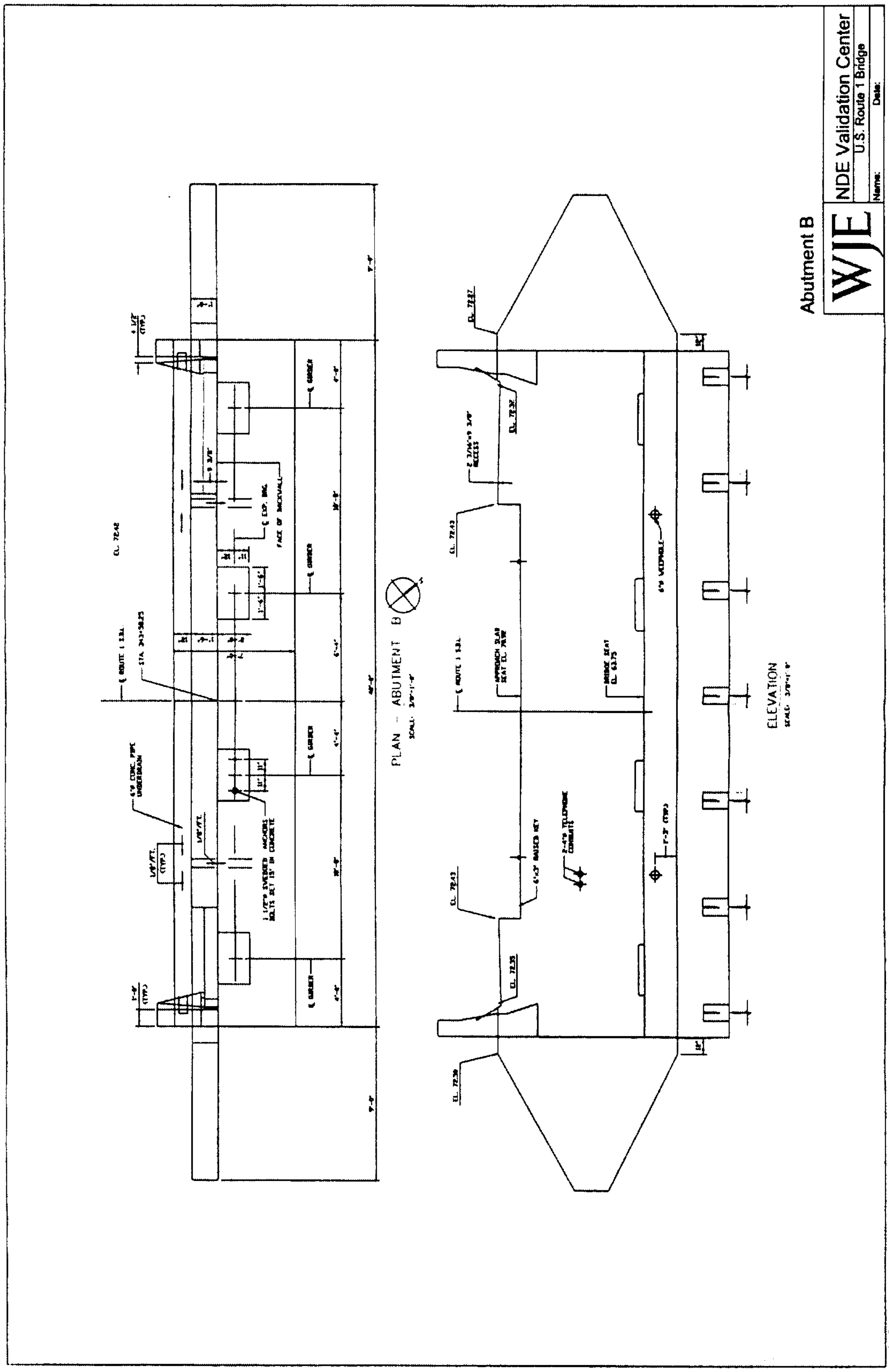
NORTH
EAST
SOUTH
WEST
ELEVATION
END ELEVATION
ELEVATION
END ELEVATION
Pier 4
WJE
NDE Validation Center
U.S. Route 1 Bridge
Name:
Date

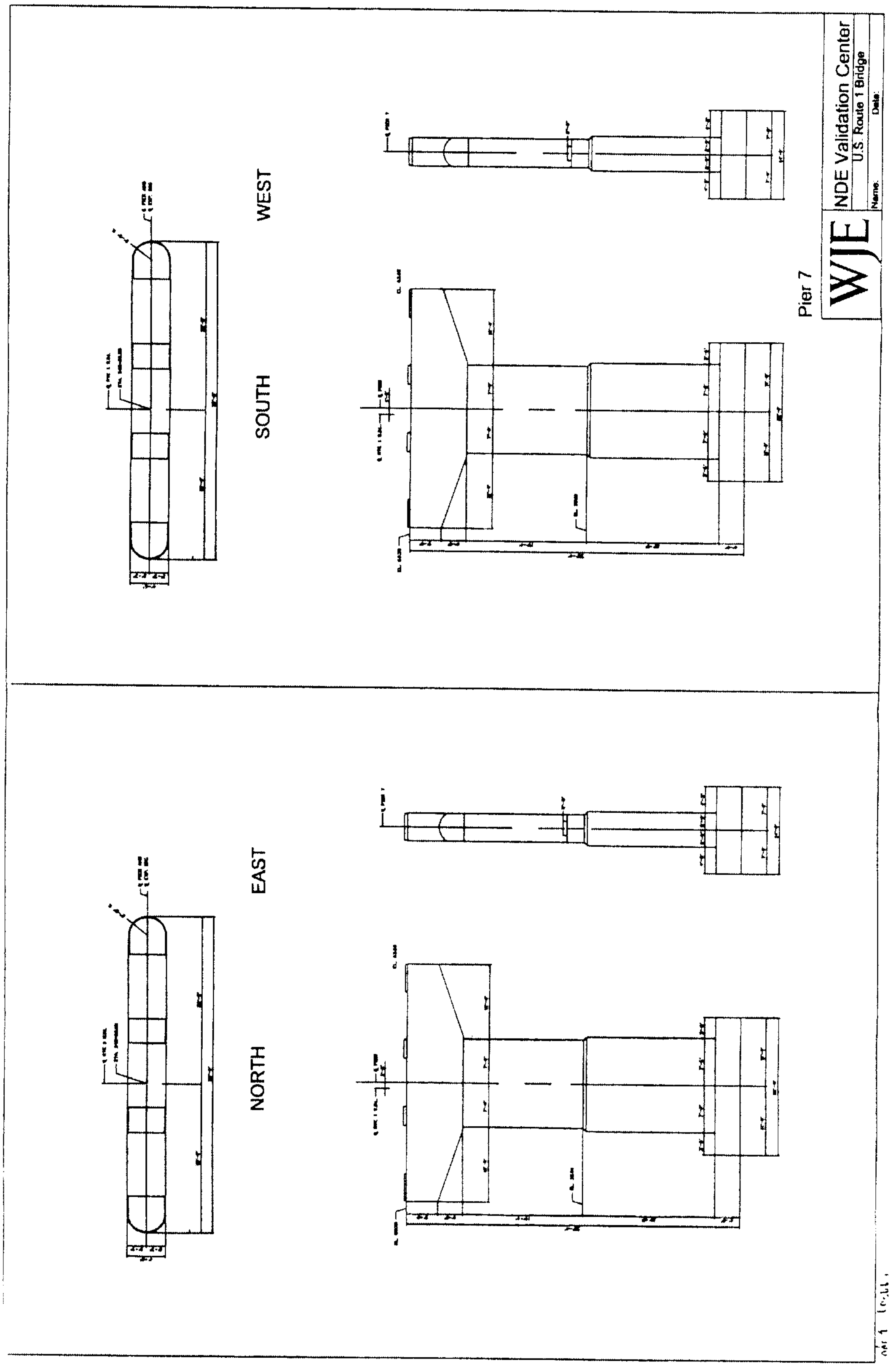


NORTH
EAST
SOUTH
WEST
END ELEVATION
END ELEVATION
Pier 5
WJE
NDE Validation Center
U.S. Route 1 Bridge
Name:
Date:

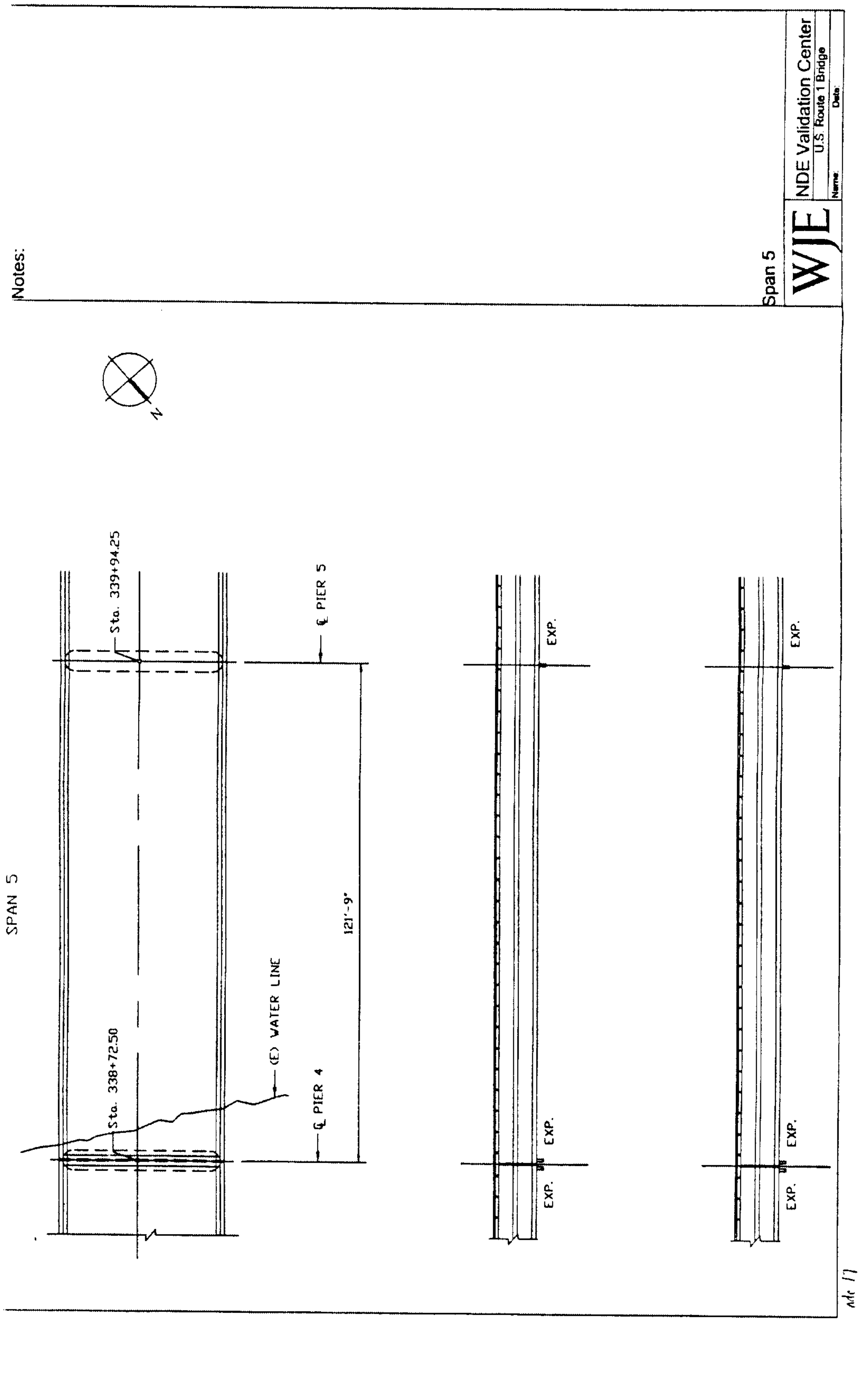


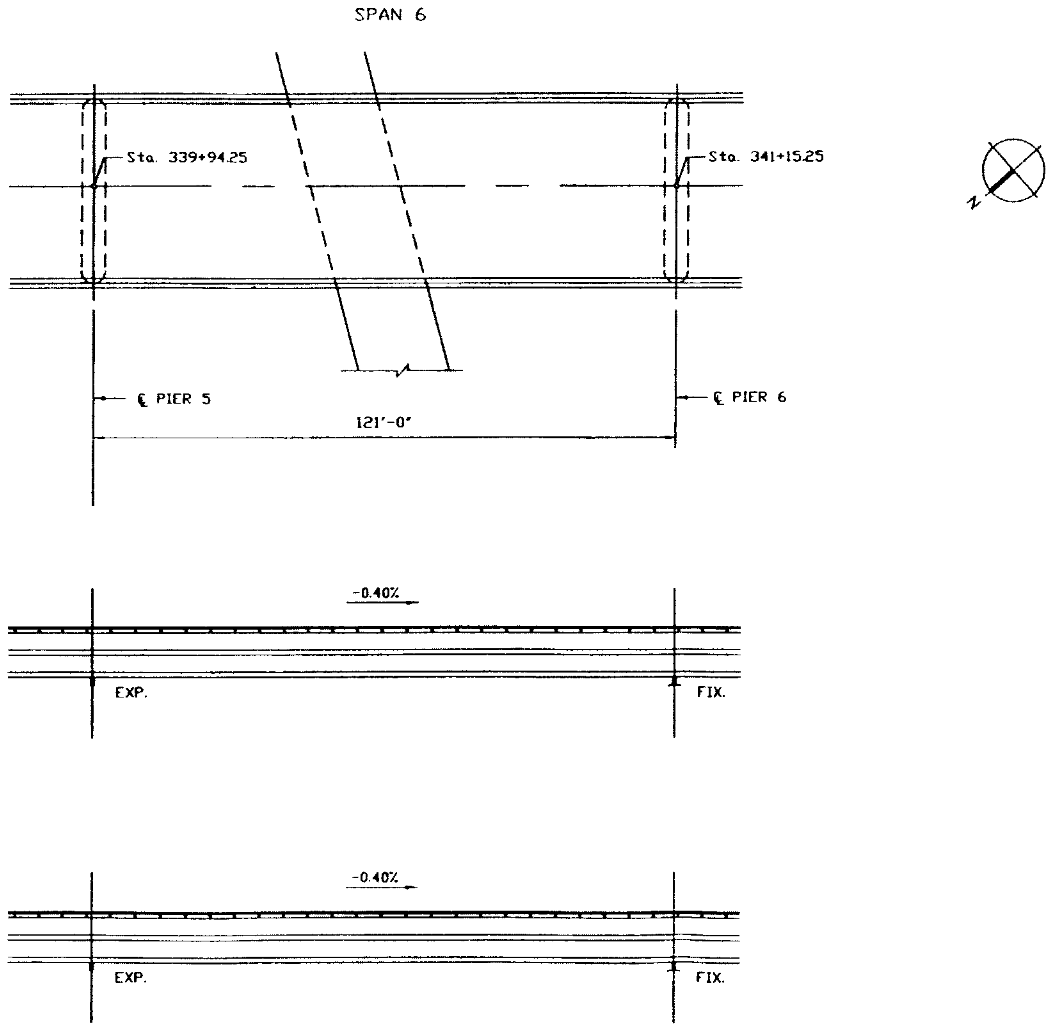
WEST
SOUTH
EAST
NORTH
ELEVATION
END ELEVATION
Pier 6
WJE
NDE Validation Center
U.S. Route 1 Bridge
Name:
Date:


Abutment B
WJE
NDE Validation Center
U.S. Route 1 Bridge
Name:
Date:
PLAN - ABUTMENT B
ELEVATION



NORTH
EAST
SOUTH
WEST
Pier 7
WJE
NDE Validation Center
U.S. Route 1 Bridge
Name:
Date:


Notes:
Span 5
WJE
NDE Validation Center
U.S. Route 1 Bridge
Name:
Date:
SPAN 5
Sta. 339+94.25
℄ PIER 5
121'-9"
(E) WATER LINE
Sta. 338+72.50
℄ PIER 4
EXP.
EXP.
EXP.
EXP.
EXP.
EXP.



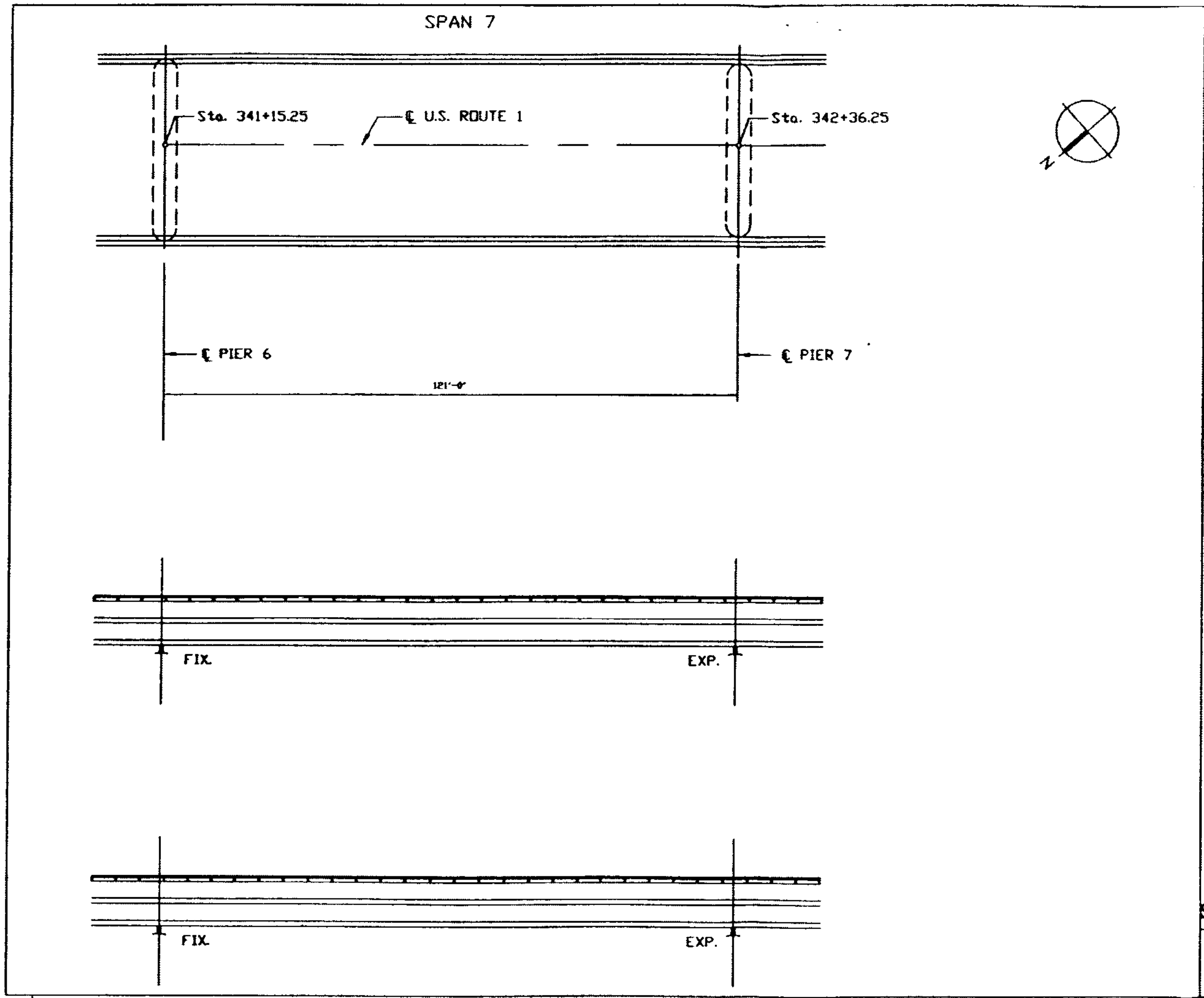
Notes:

Span 6

WJE NDE Validation Center

U.S. Route 1 Bridge

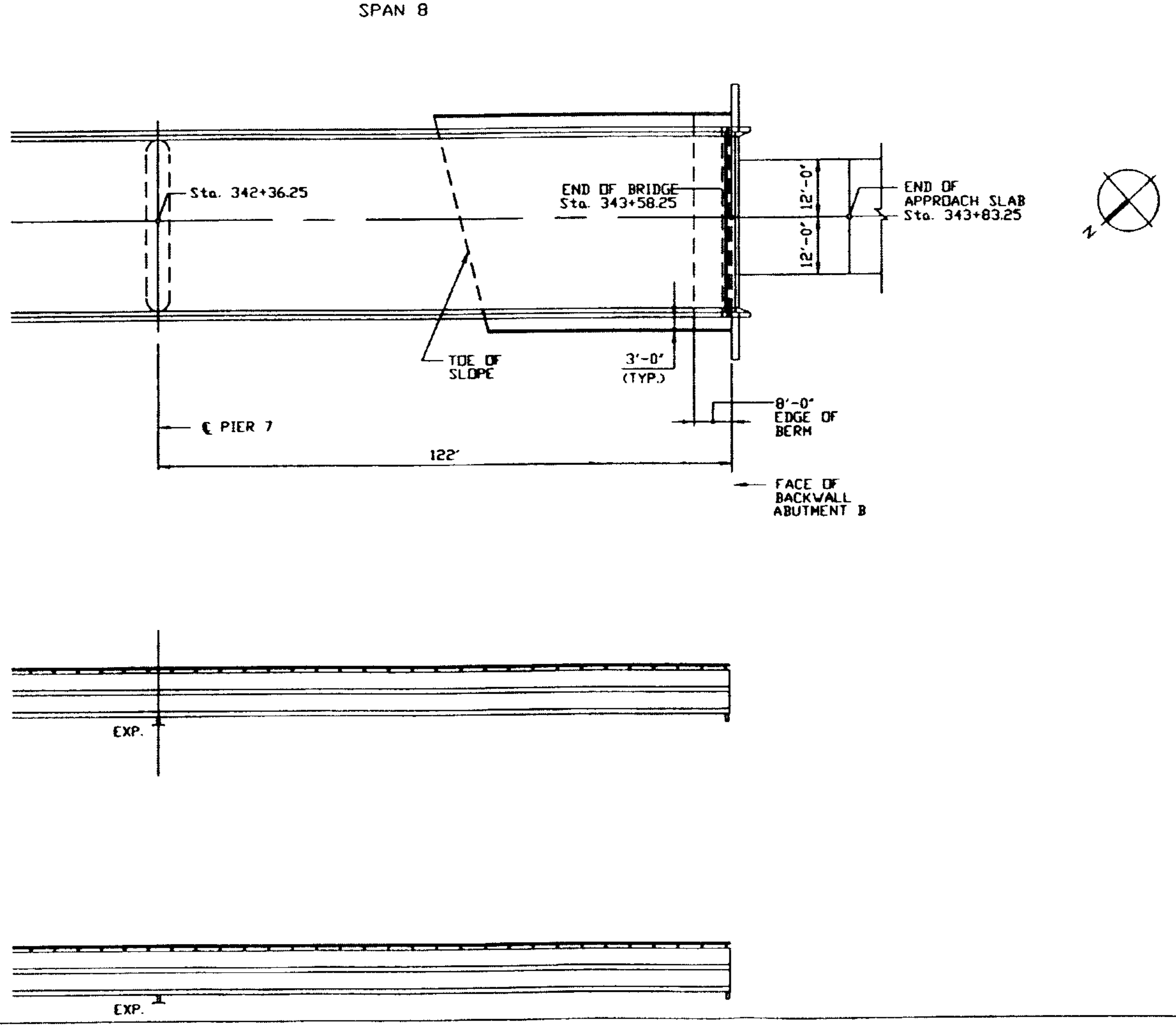
Name: Date:



Notes:

Span 7

WJE NDE Validation Center
U.S. Route 1 Bridge
Name: Date:



Notes:

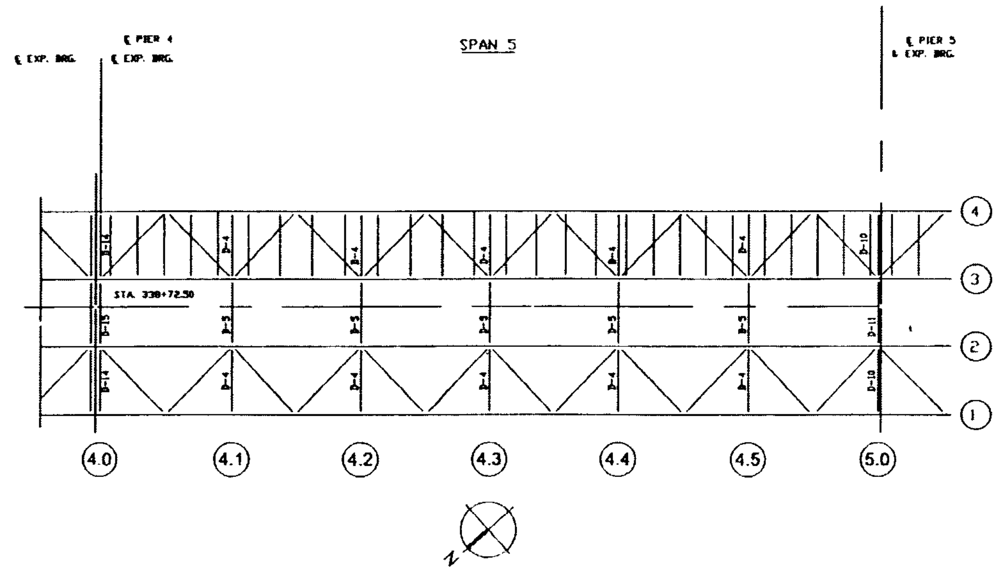
Span 8

WJE

NDE Validation Center

U.S. Route 1 Bridge

Name: Date:



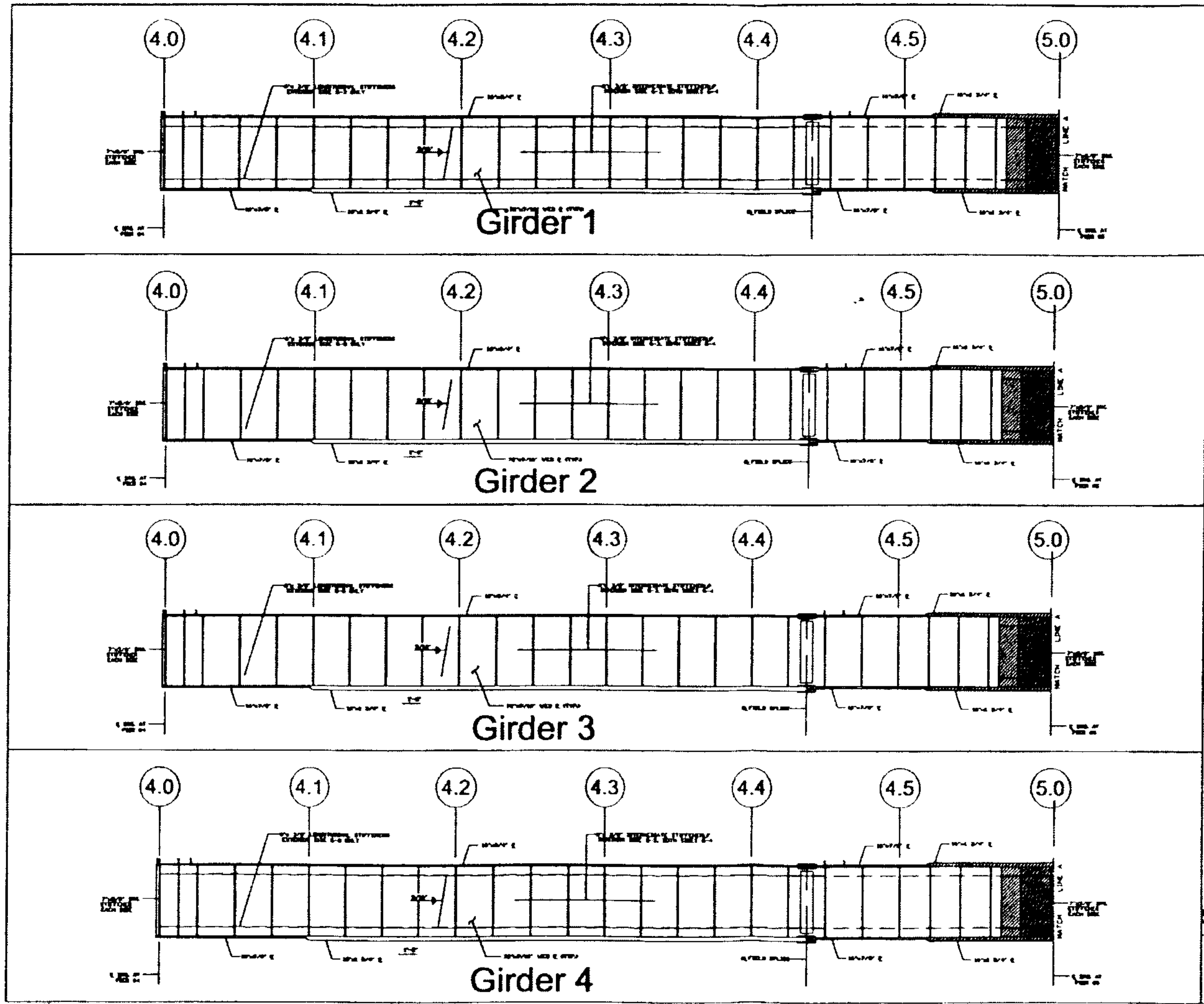
Notes:

Span 5

WJE NDE Validation Center

U.S. Route 1 Bridge

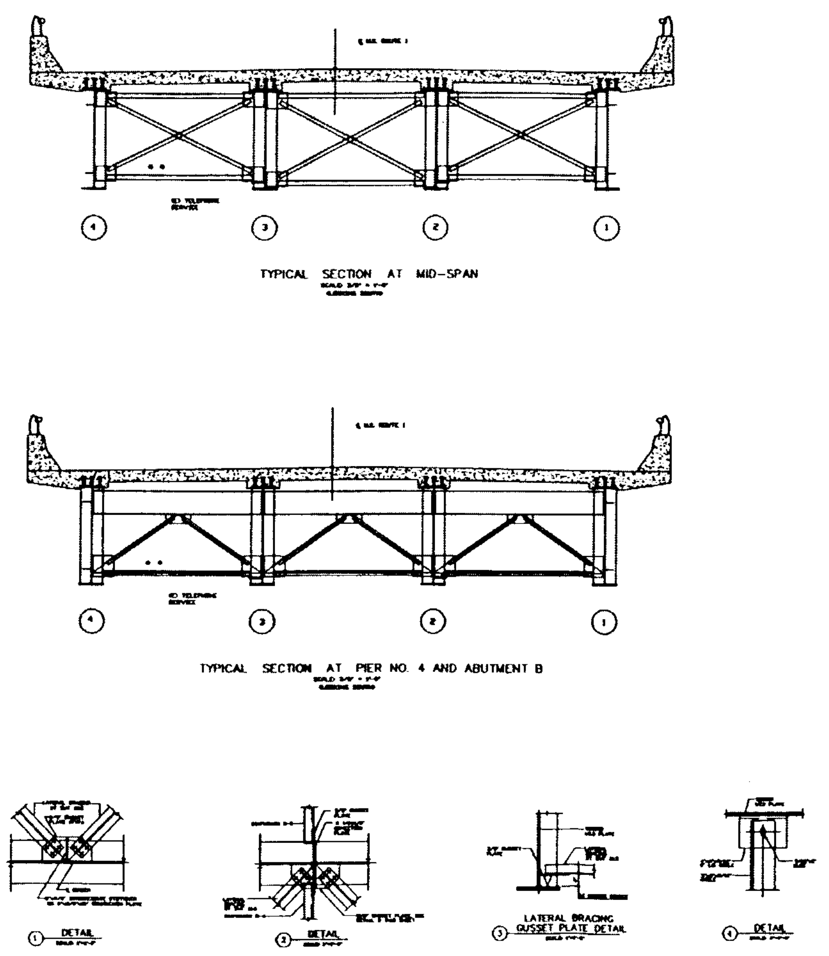
Name: Date:



Notes:

Span 5

WJE | NDE Validation Center
U.S. Route 1 Bridge
Name: Date:

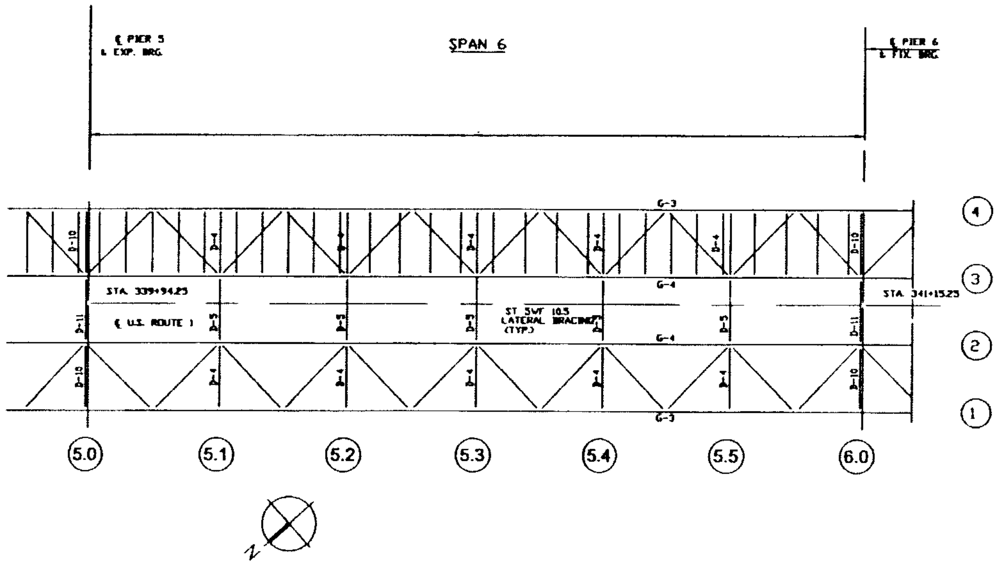


Notes:

Span ____________

WJE NDE Validation Center
U.S. Route 1 Bridge
Name: Date:

ile15



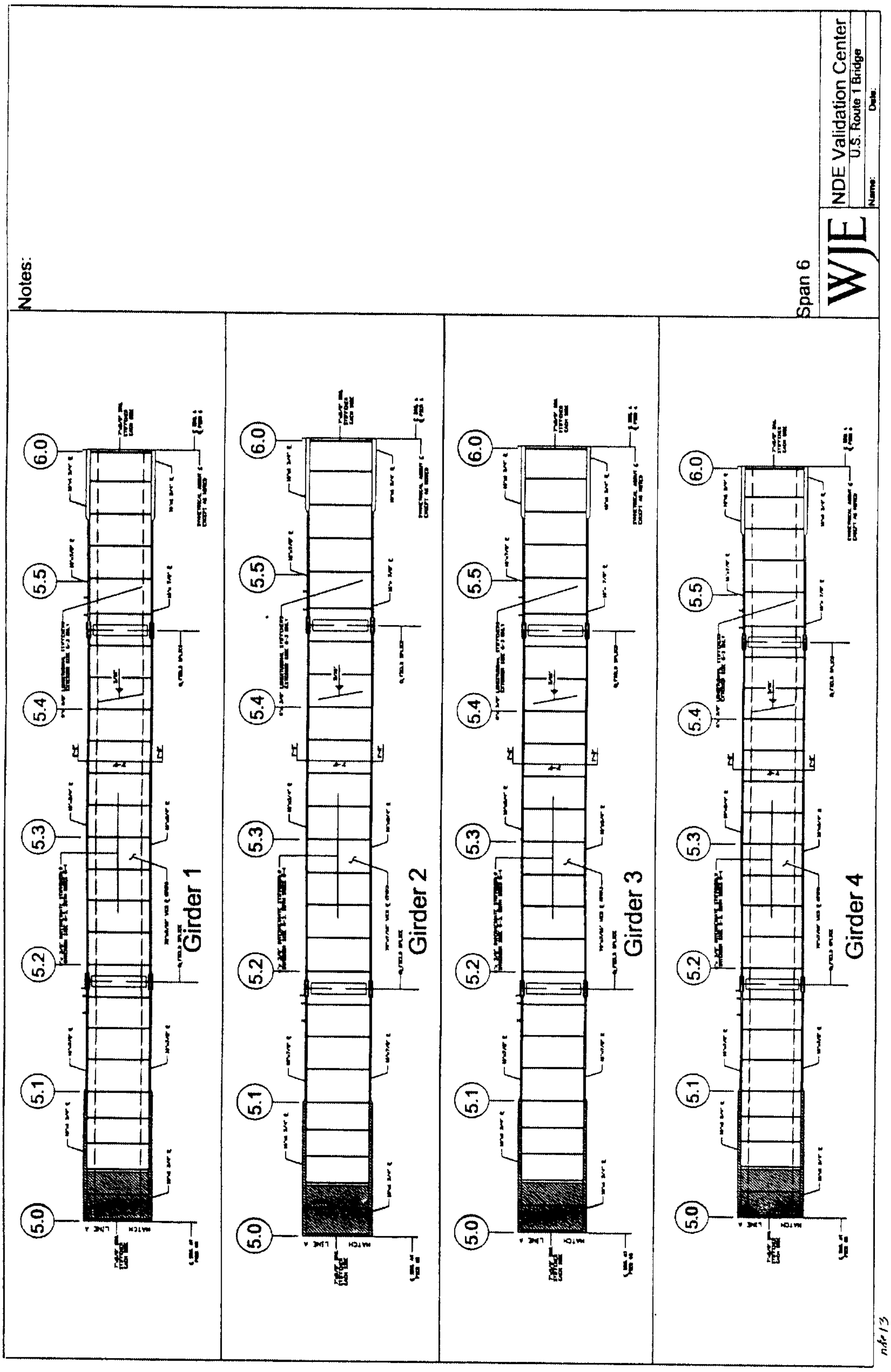
Notes:

Span 6

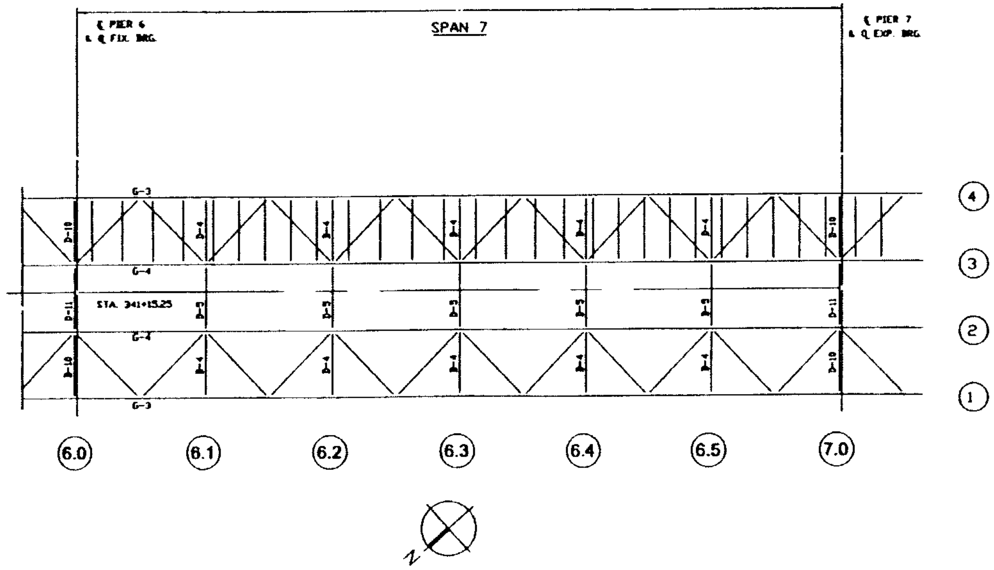
WJE NDE Validation Center

U.S. Route 1 Bridge

Name: Date:


Notes:
Span 6
WJE
NDE Validation Center
U.S. Route 1 Bridge
Name:
Date:
Girder 1
Girder 2
Girder 3
Girder 4
5.0
5.1
5.2
5.3
5.4
5.5
6.0

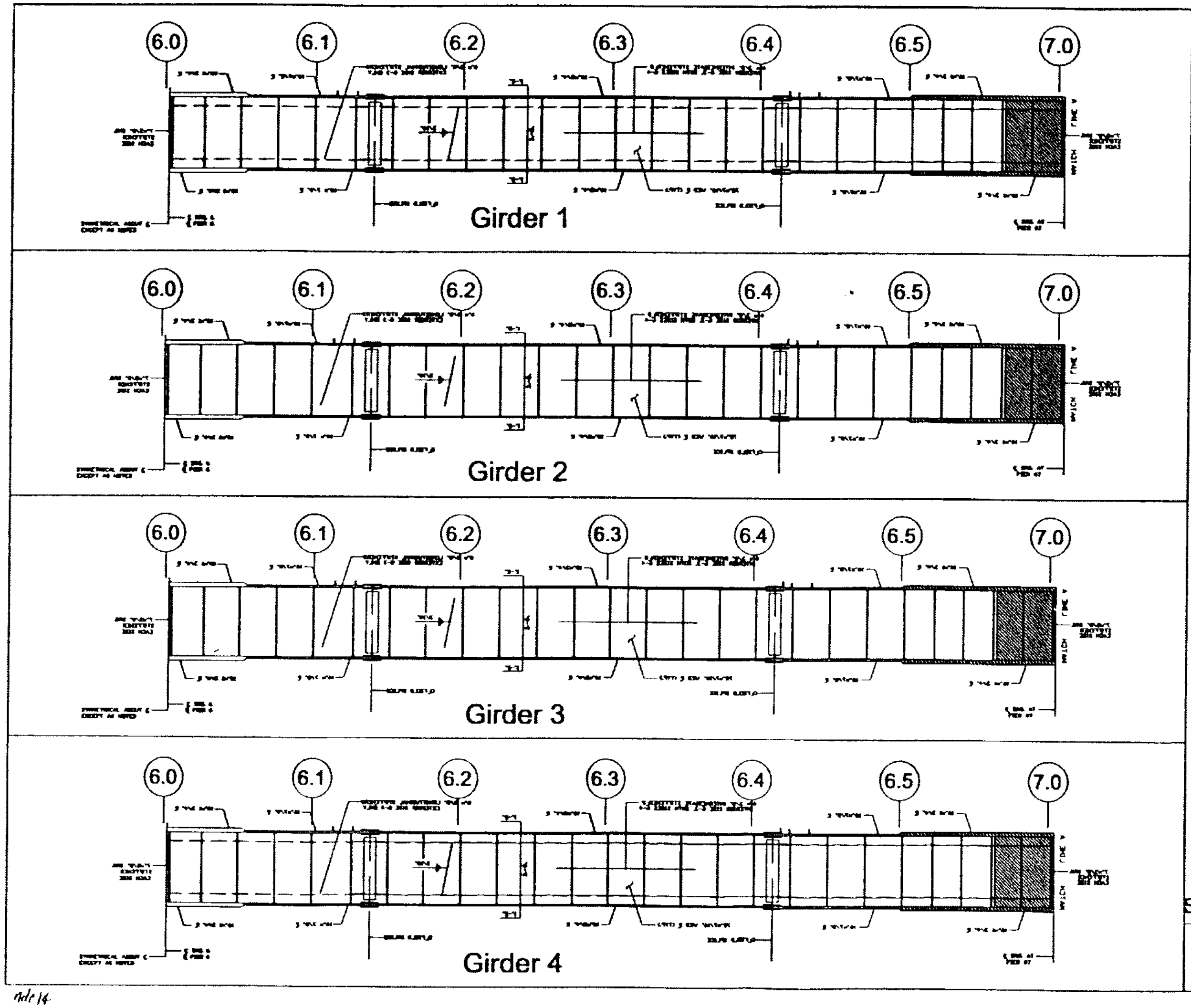
Notes:



Span 7

WJE | NDE Validation Center
U.S. Route 1 Bridge
Name: Date:

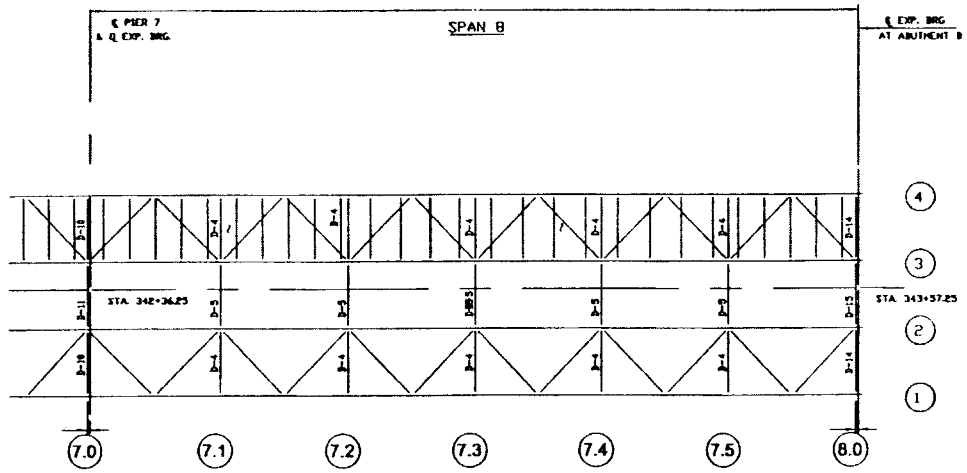
nJe 9



Notes:

Span 7

WJE NDE Validation Center
U.S. Route 1 Bridge
Name: Date:



Notes:

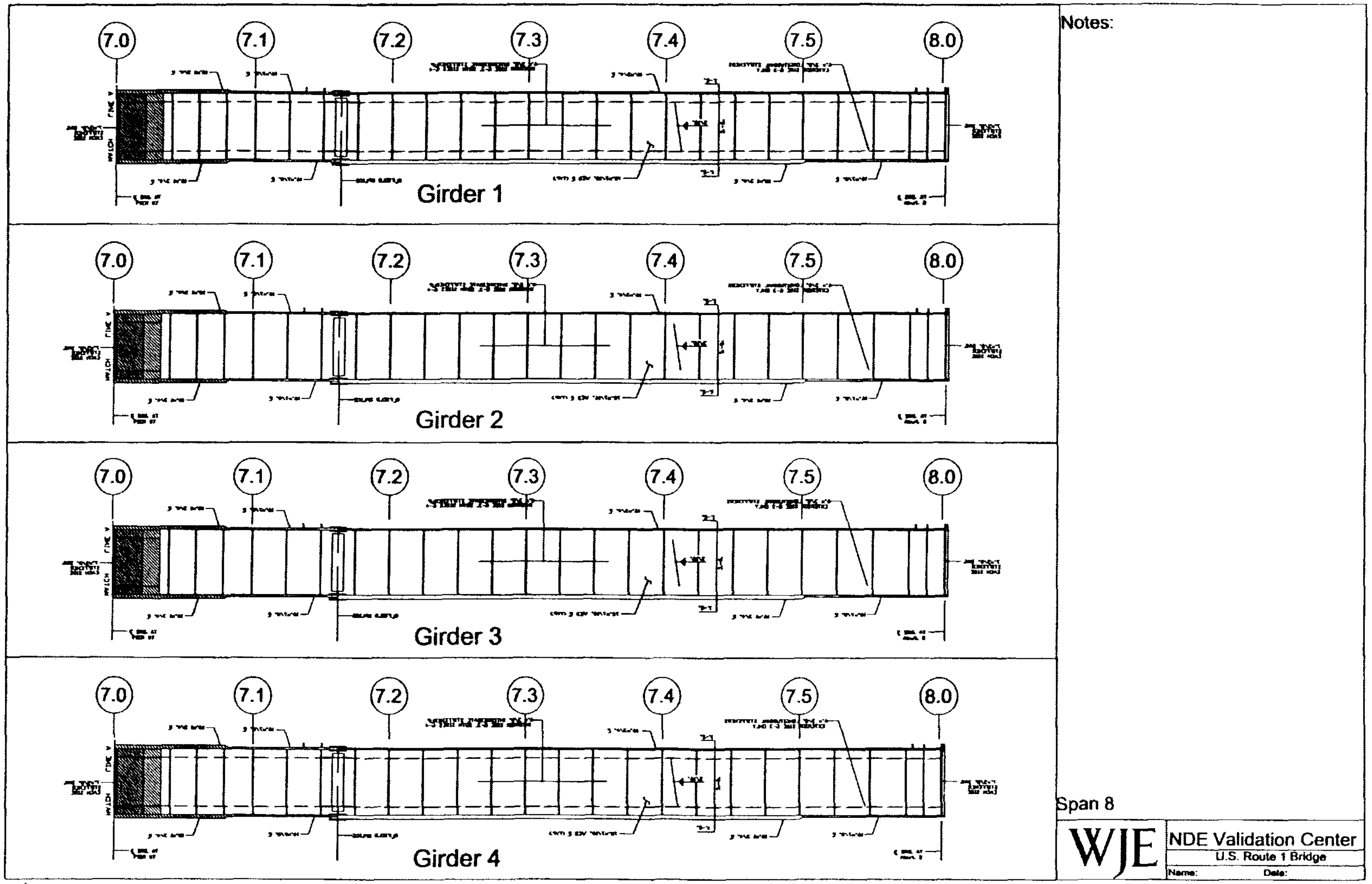
Span 8

WJE

NDE Validation Center

U.S. Route 1 Bridge

Name: Date:



Girder 1
Girder 2
Girder 3
Girder 4
7.0
7.1
7.2
7.3
7.4
7.5
8.0
Notes:
Span 8
WJE
NDE Validation Center
U.S. Route 1 Bridge
Name:
Date:

Task H

Task H

Task H

Task H

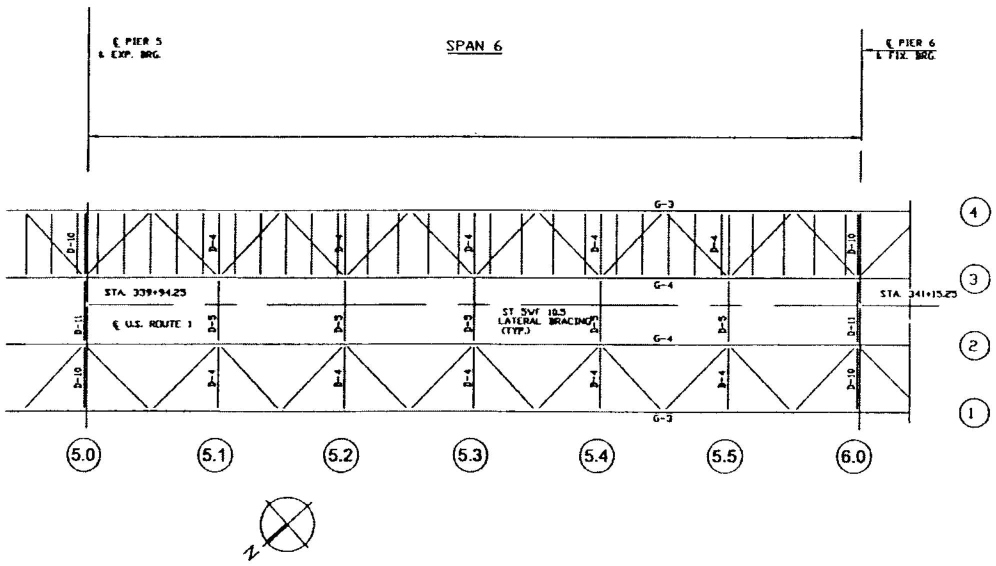
Task H

Task H

Task H

Task H

Notes:

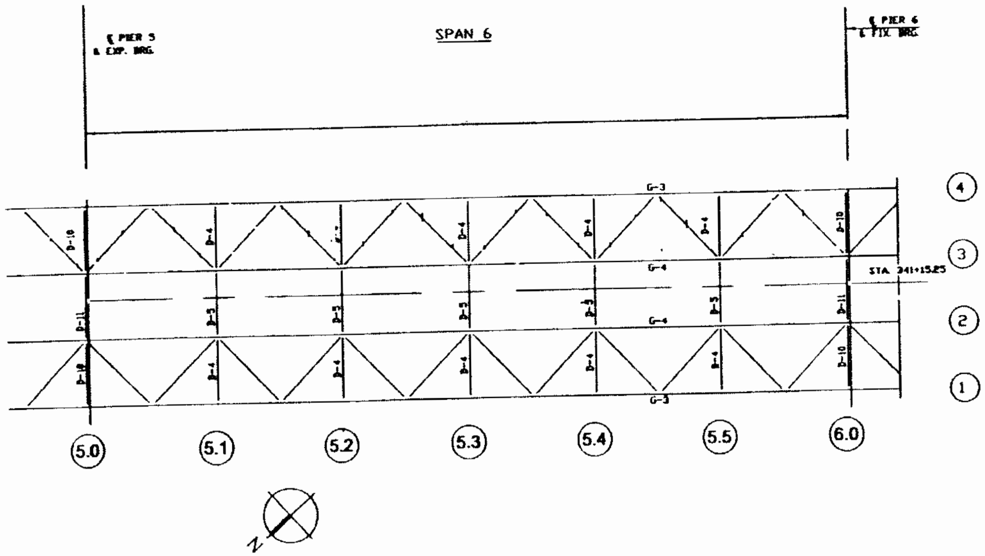


Span 6

WJE NDE Validation Center

U.S. Route 1 Bridge

Name: Date:



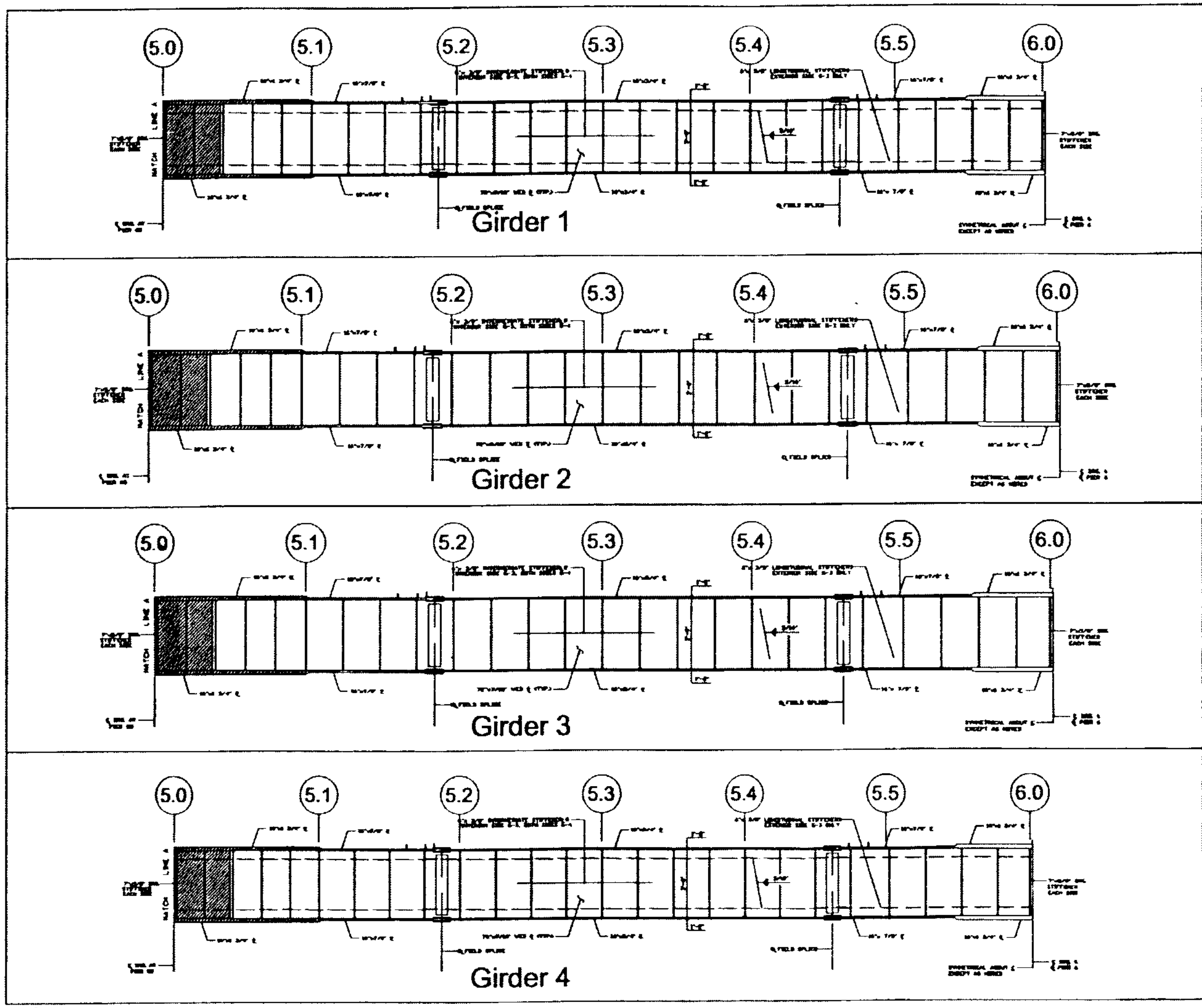
Notes:

Span 6

WJE NDE Validation Center

U.S. Route 1 Bridge

Name: Date:



Notes:

Span 6

WJE

NDE Validation Center

U.S. Route 1 Bridge

Name: Date:

ndr13

Task J

Task J

Task J

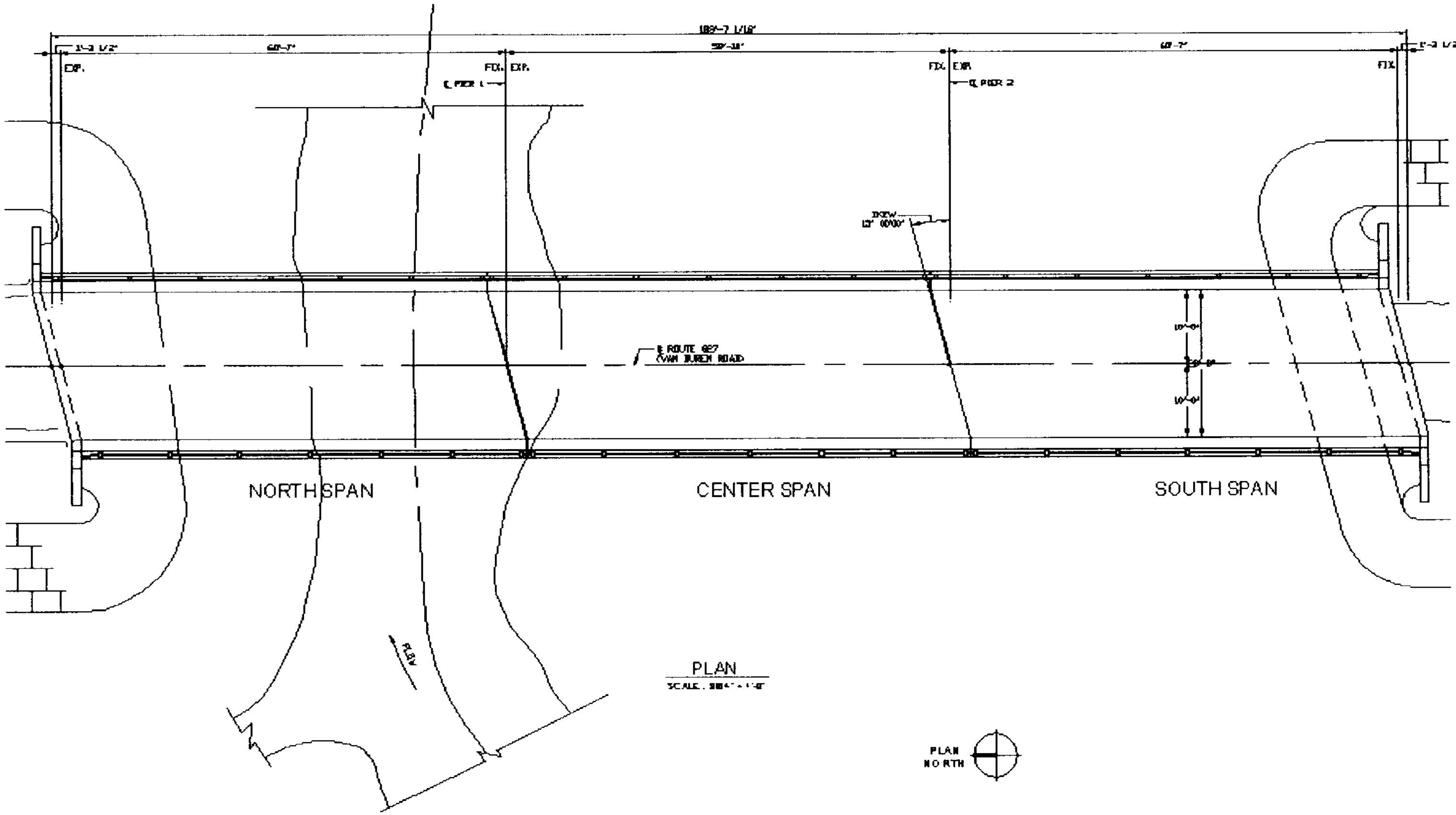
Task J

Task J

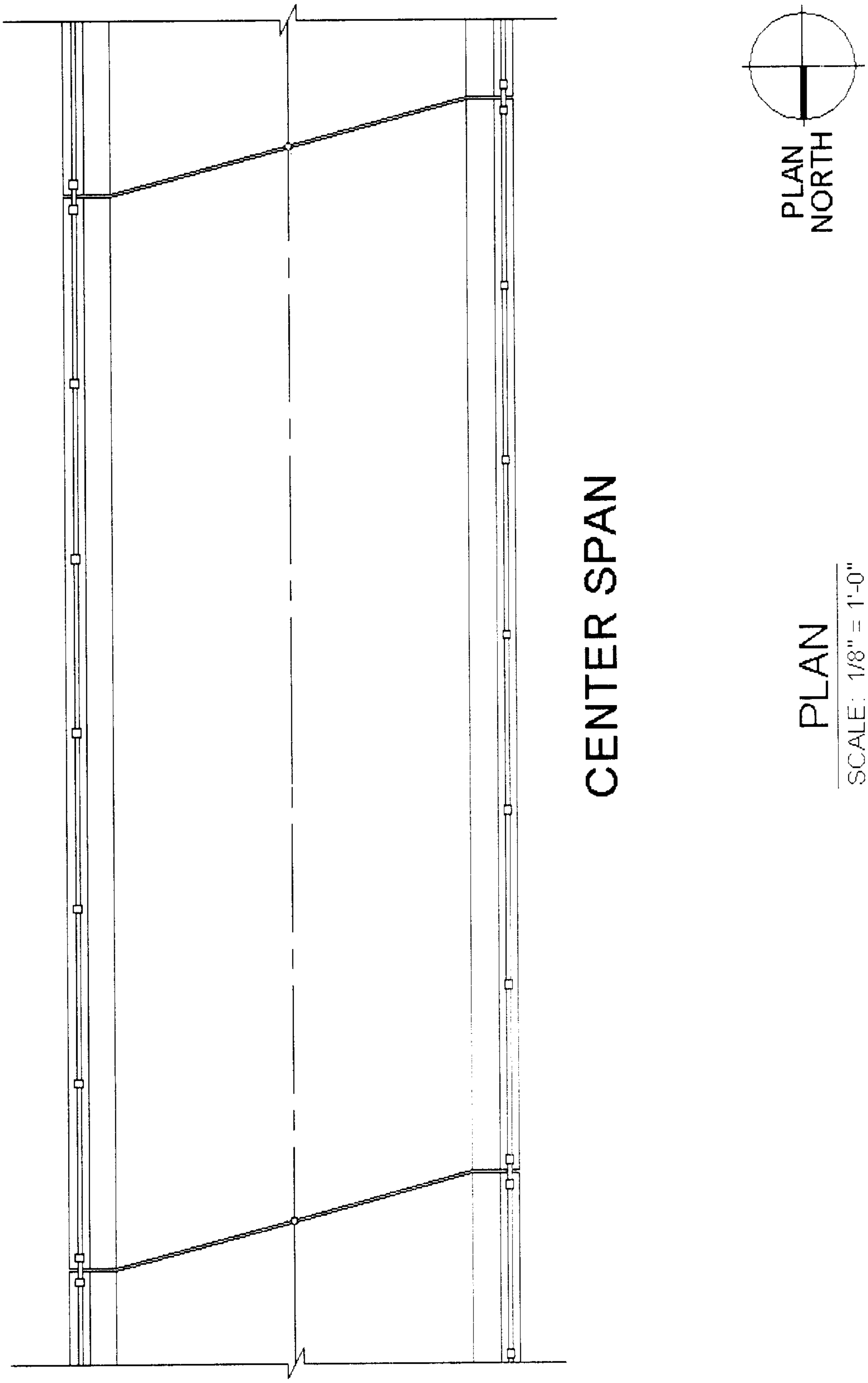
Task J

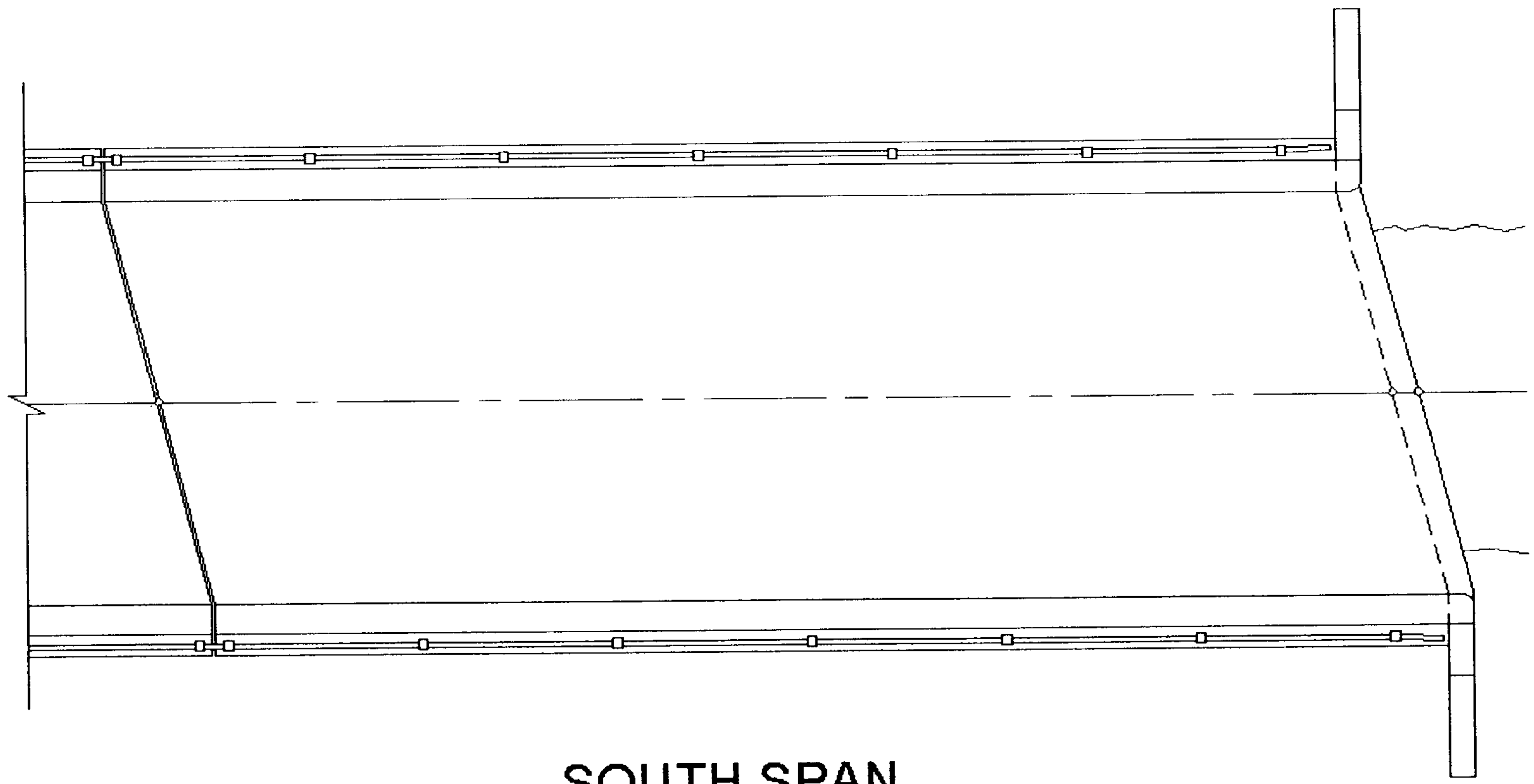
Task J

Task J



PLAN

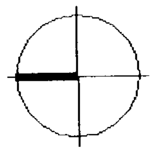

PLAN
NORTH
CENTER SPAN
PLAN
SCALE: 1/8" = 1'-0"



SOUTH SPAN

PLAN

SCALE: 1/8" = 1'-0"



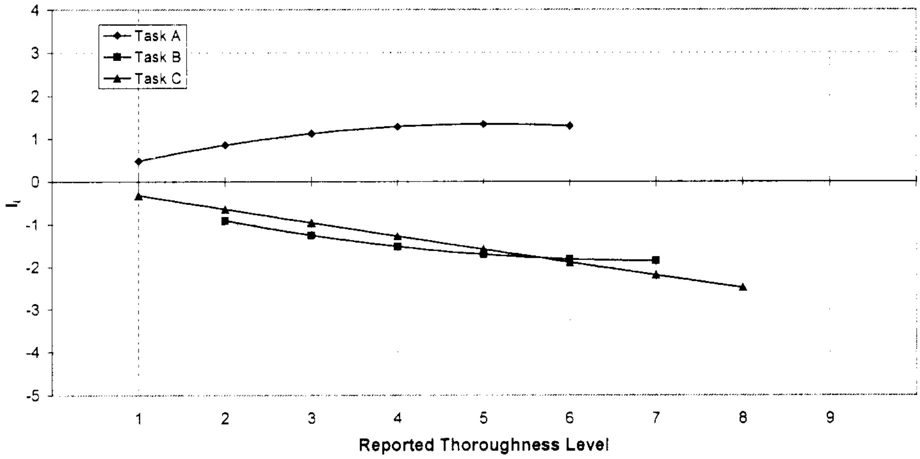
APPENDIX L. FACTOR INFLUENCE FIGURES

Most of the inspector and inspection factors used in the figures in this appendix were assessed in such a way that quantitative data could be collected. However, some of the data were collected in a purely qualitative form. The qualitative data were subsequently transformed into a pseudo-quantitative form for use in the regression analyses. Specifically, the inspector factor General Education Level was transformed into a quantitative form using the following scale:

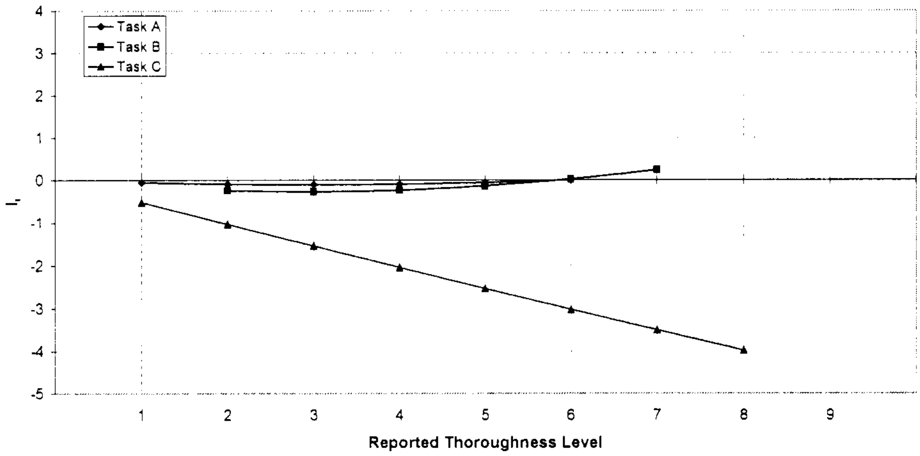
1 = Some high school
2 = High school degree or equivalent
3 = Some trade school
4 = Trade school degree
5 = Some college
6 = Associate's degree
7 = Bachelor's degree
8 = Some graduate work
9 = Master's degree
10 = Terminal degree

Similarly, the Formal Bridge Inspection Training factor was calculated as the total number of FHWA training courses that an inspector had reported completing.

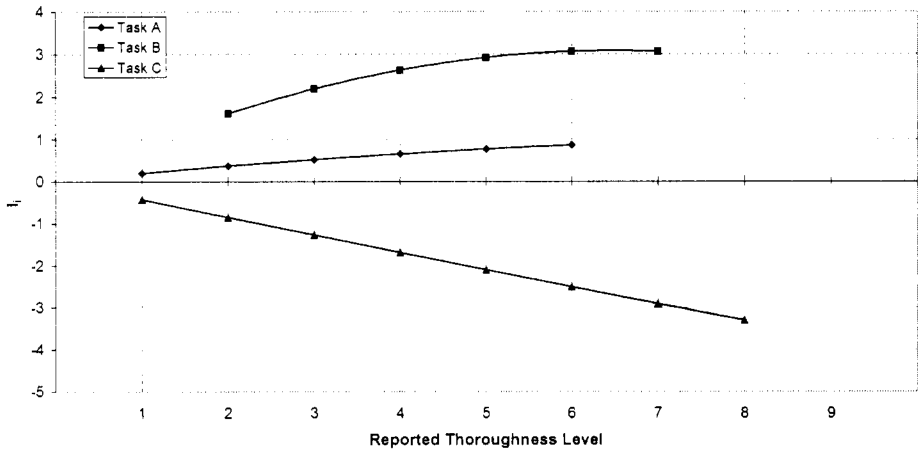
Color vision attributes were quantified in two different manners to simulate different uses of color vision. First, the total number of minor confusions (i.e., errors between contiguous test caps) from the PV-16 color vision test was used as a measure of inspector ability to distinguish similar colors. It was speculated that this could be of importance in assessing structural deterioration that manifests itself only as a slight change in color (e.g., some types of concrete deterioration). Second, the number of major confusions from the PV-16 color vision test was used as a measure of inspector ability to distinguish specific colors (e.g., green-red). It was thought that this type of color vision may be a trait necessary for fatigue crack detection. Direct visual acuity (both near and distance) was quantified as the "bottom" number from the vision test results (e.g., 20/12.5 visual acuity = 12.5).



a. Deck

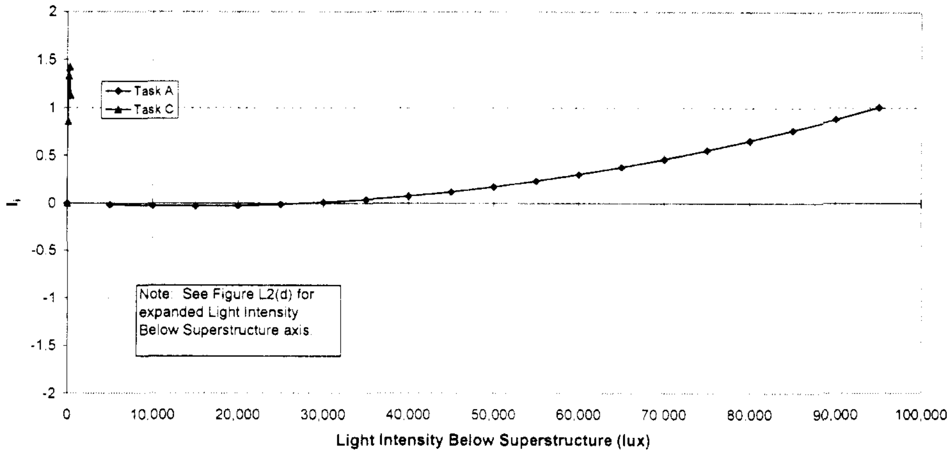


b. Superstructure

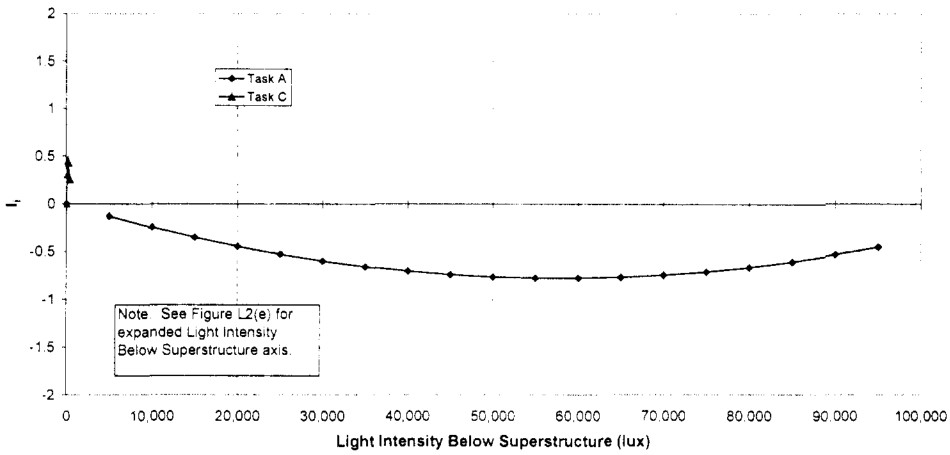


c. Substructure

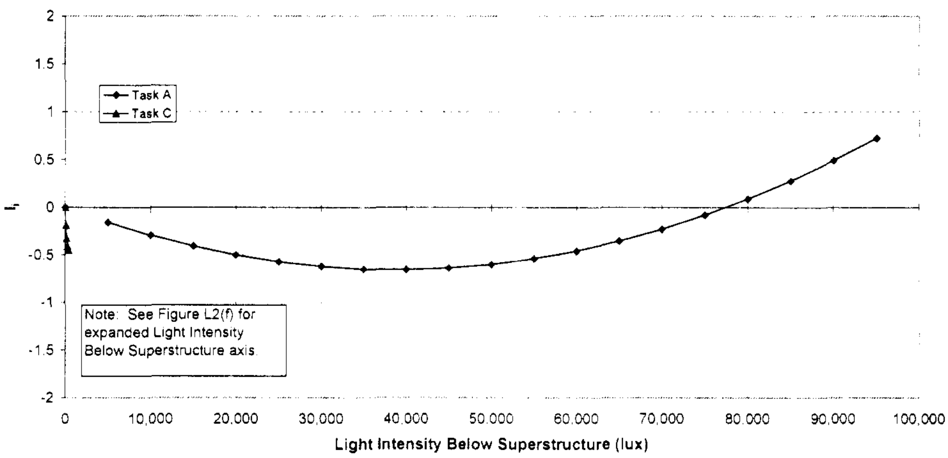
Figure L1. Influence of inspection factor Reported Thoroughness Level (1=Much less thorough than normal, 9=Much more thorough than normal) on Condition Ratings.



a. Deck

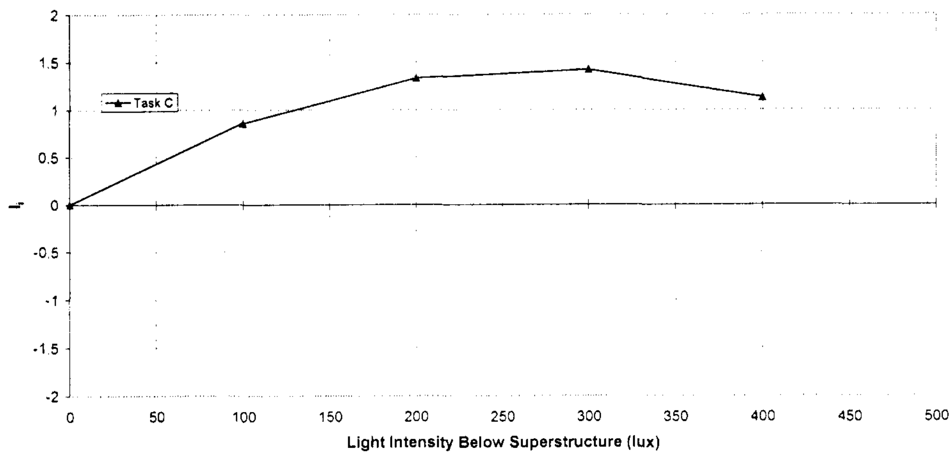


b. Superstructure

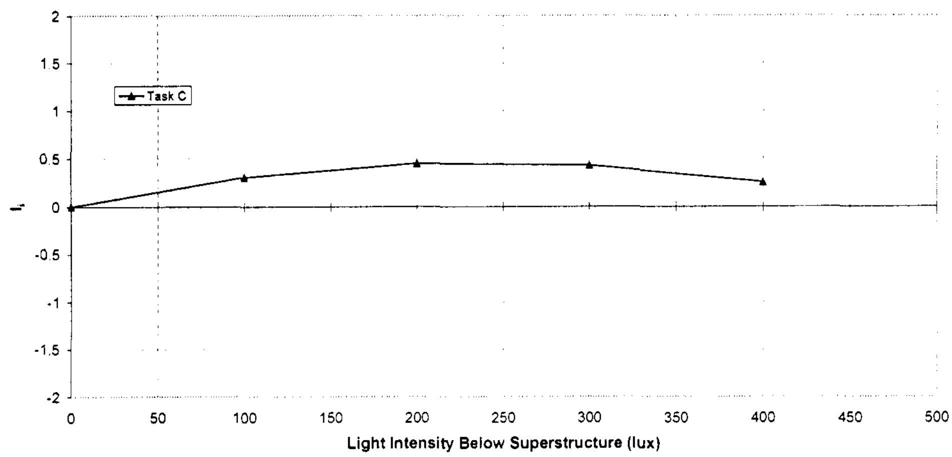


c. Substructure

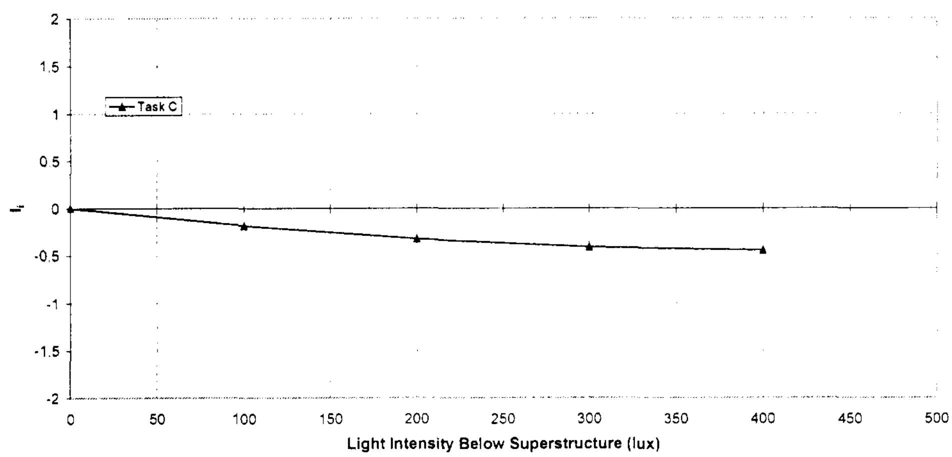
Figure L2. Influence of inspection factor Light Intensity Below Superstructure on Condition Ratings.



d. Deck

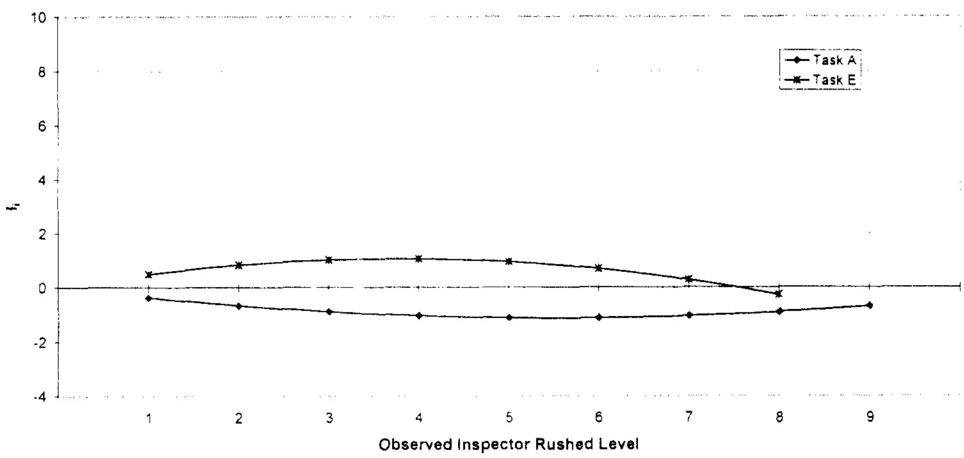


e. Superstructure

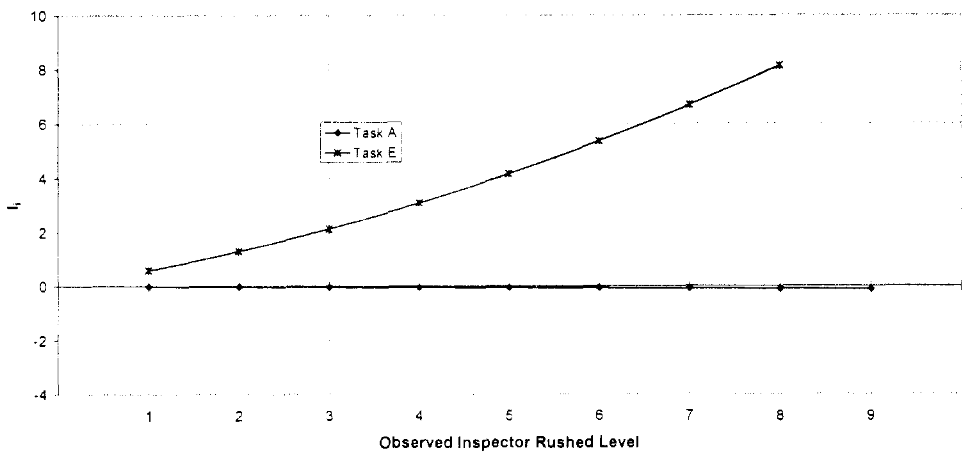


f. Substructure

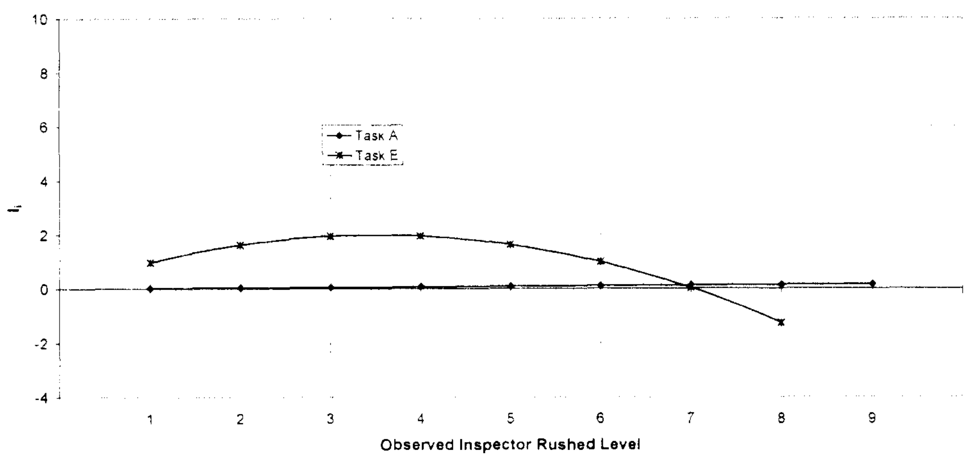
Figure L2. Influence of inspection factor Light Intensity Below Superstructure on Condition Ratings (continued).



a. Deck

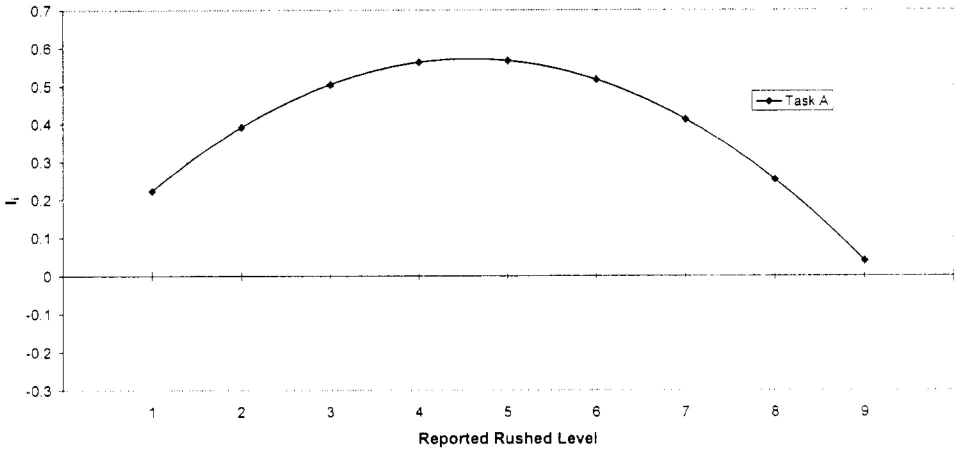


b. Superstructure

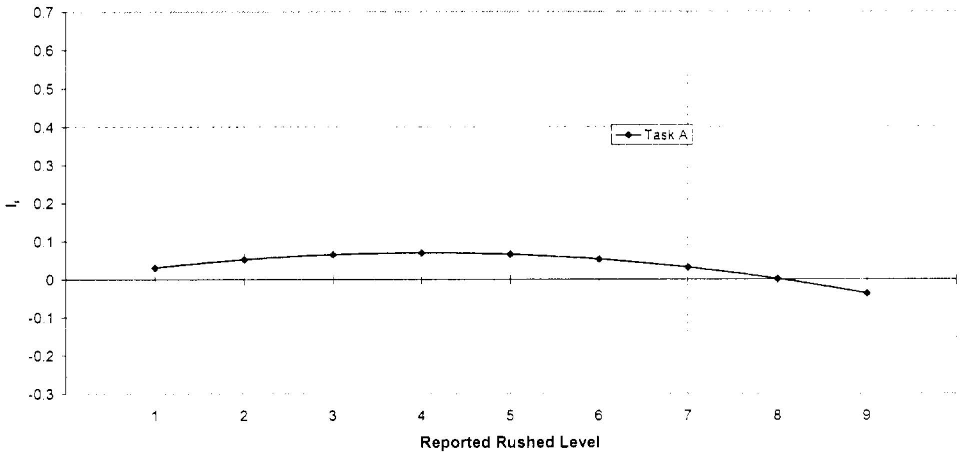


c. Substructure

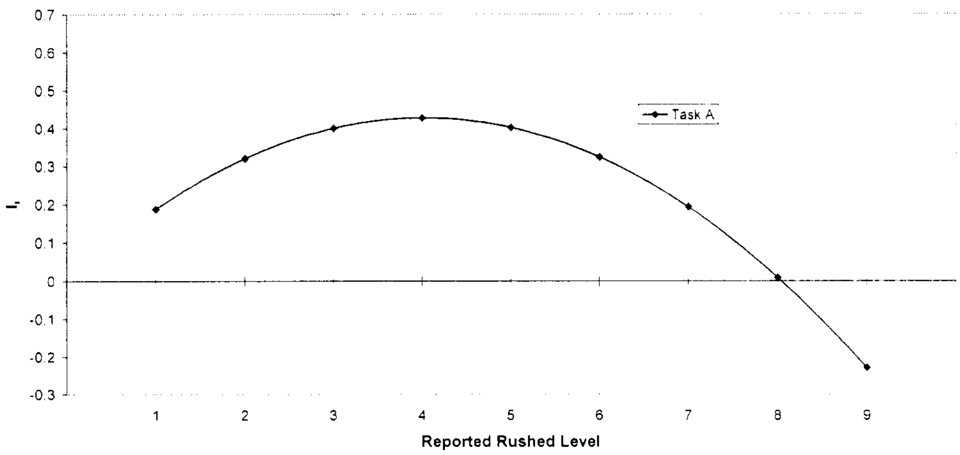
Figure L3. Influence of inspection factor Observed Inspector Rushed Level (1=Not rushed, 9=Very rushed) on Condition Ratings.



a. Deck

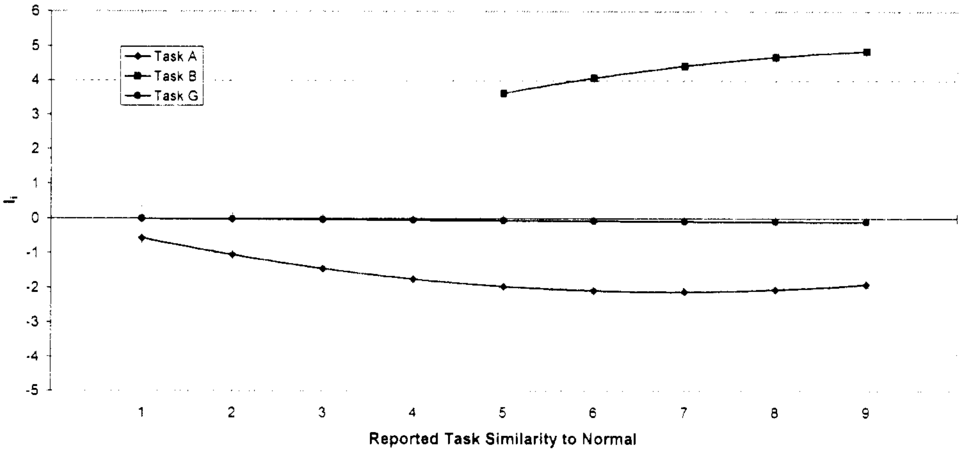


b. Superstructure

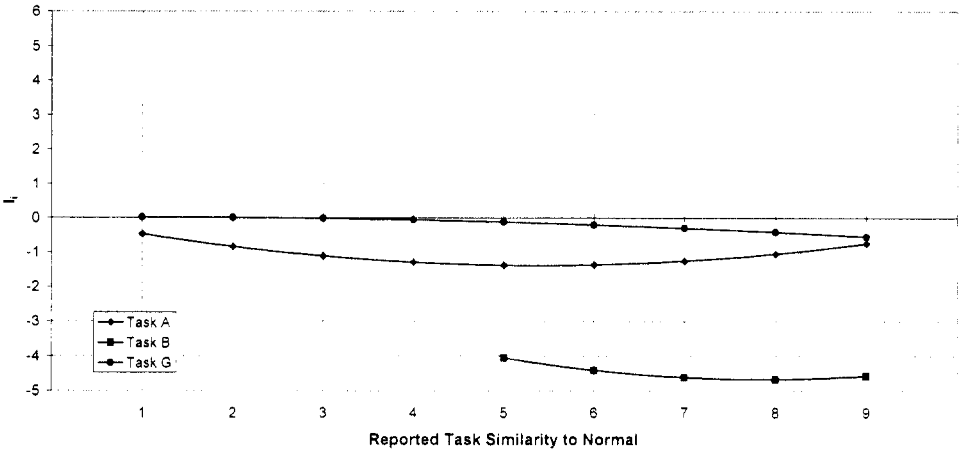


c. Substructure

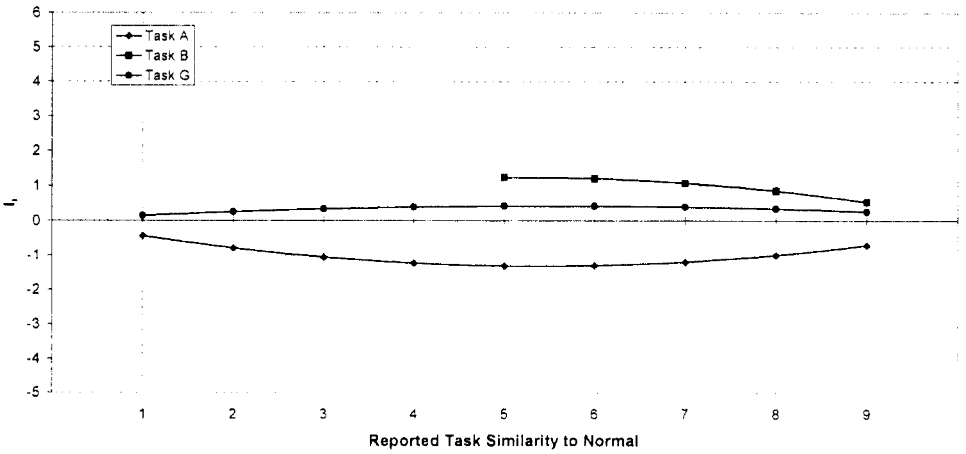
Figure L4. Influence of inspection factor Reported Rushed Level (1=Not rushed, 9=Very rushed) on Condition Ratings.



a. Deck

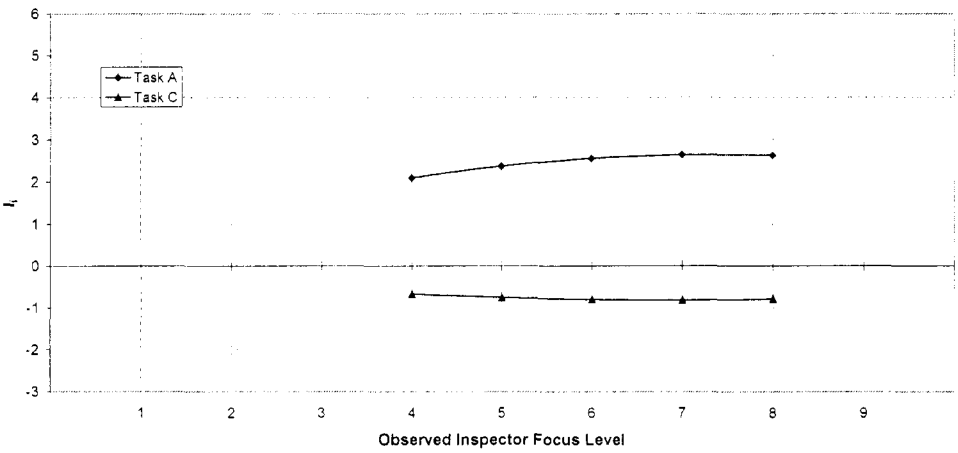


b. Superstructure

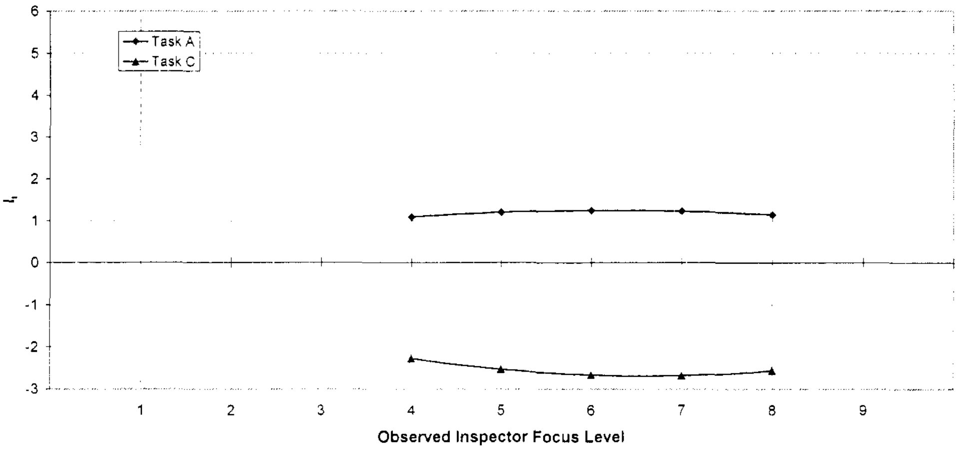


c. Substructure

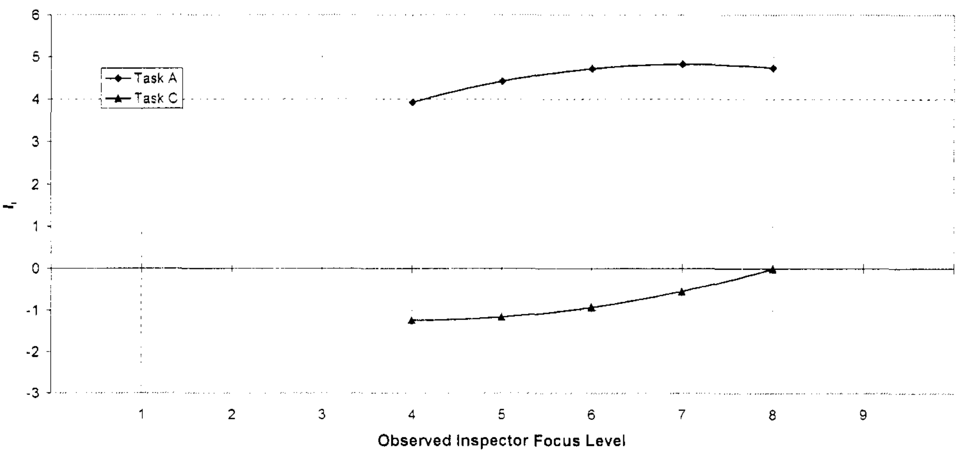
Figure L5. Influence of inspection factor Reported Task Similarity to Normal (1=Not similar, 9=Very similar) on Condition Ratings.



a. Deck

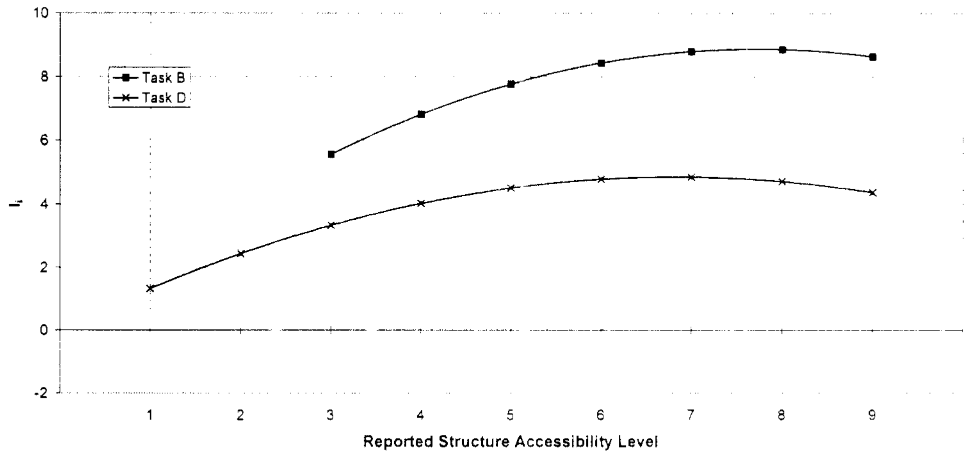


b. Superstructure

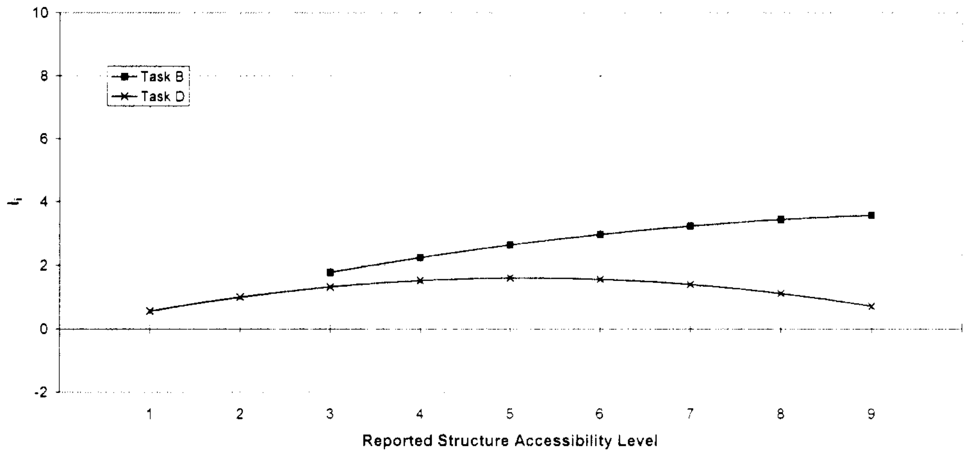


c. Substructure

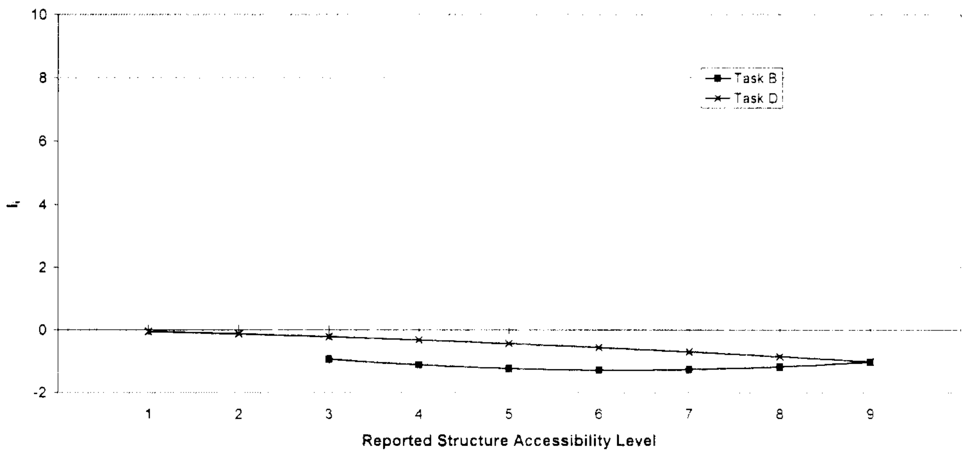
Figure L6. Influence of inspection factor Observed Inspector Focus Level (1=Very unfocused, 9=Very focused) on Condition Ratings.



a. Deck

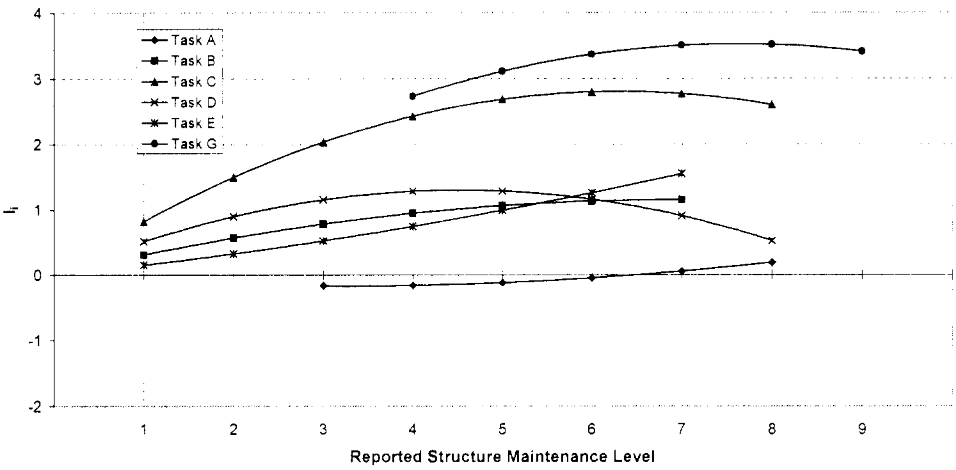


b. Superstructure

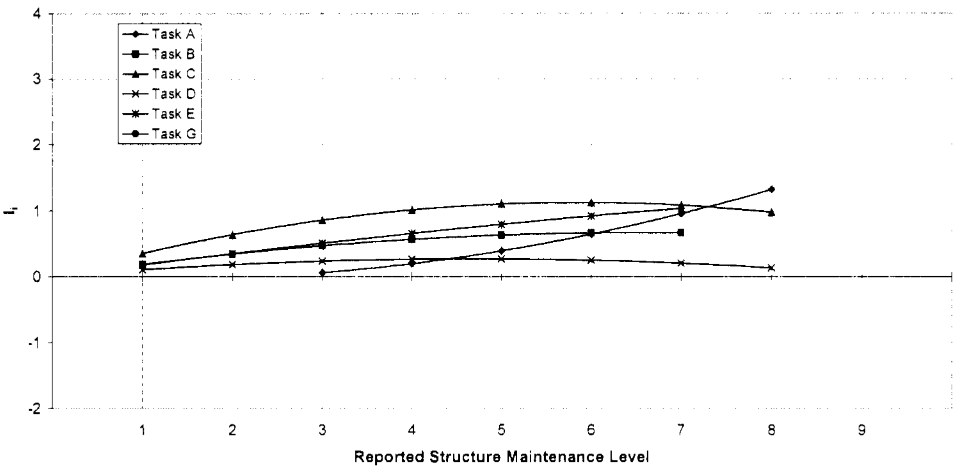


c. Substructure

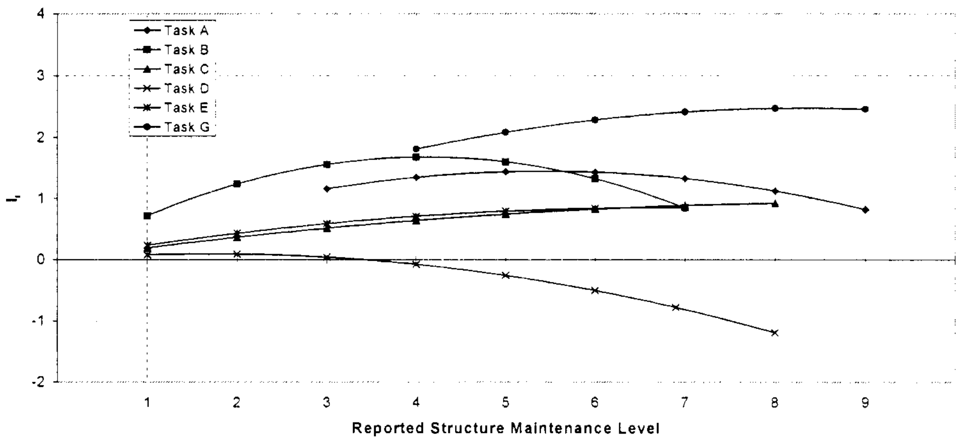
Figure L7. Influence of inspection factor Reported Structure Accessibility Level (1=Very inaccessible, 9=Very accessible) on Condition Ratings.



a. Deck

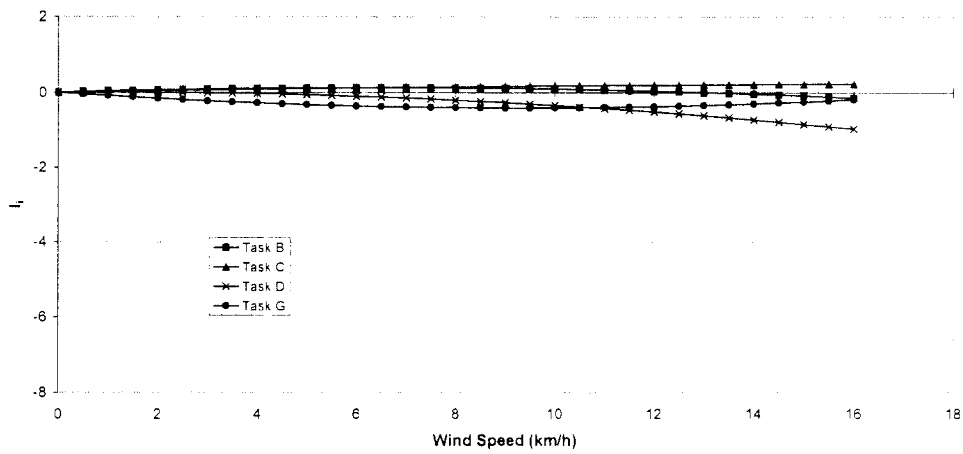


b. Superstructure



c. Substructure

Figure L8. Influence of inspection factor Reported Structure Maintenance Level (1=Very poorly, 9=Very well) on Condition Ratings.



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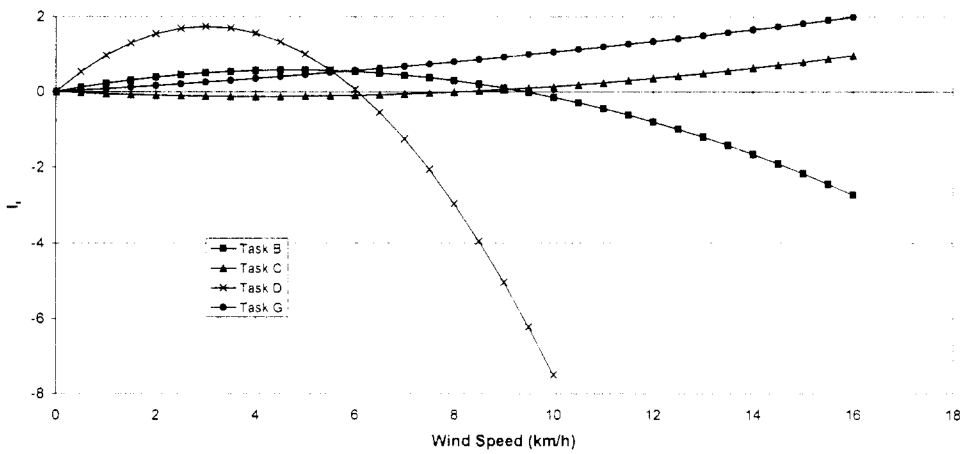

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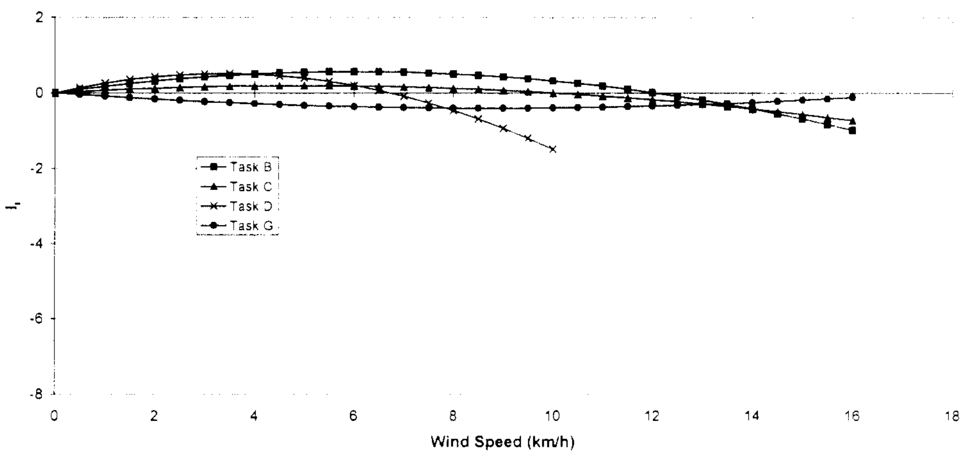
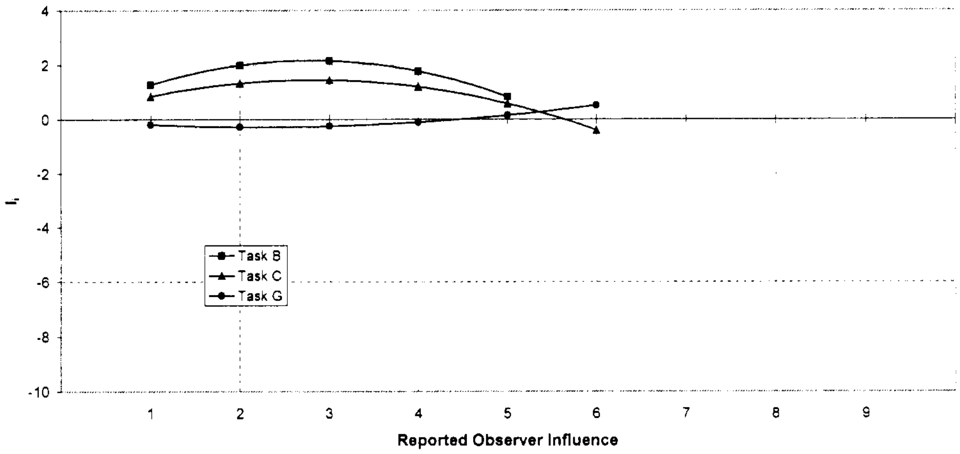
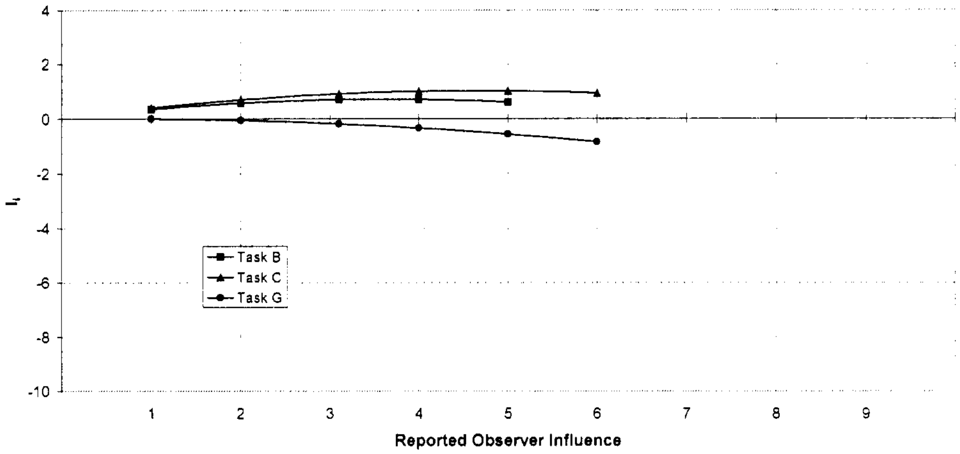


c. Substructure

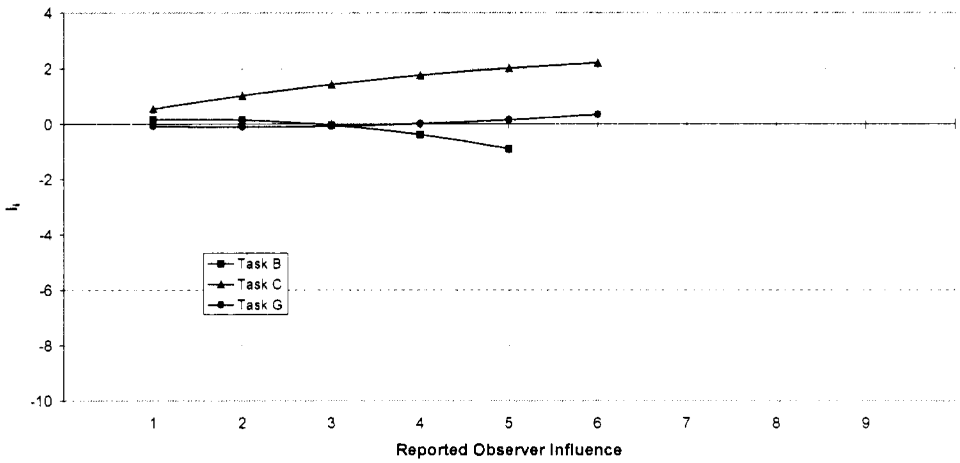
Figure L9. Influence of inspection factor Wind Speed on Condition Ratings.



a. Deck

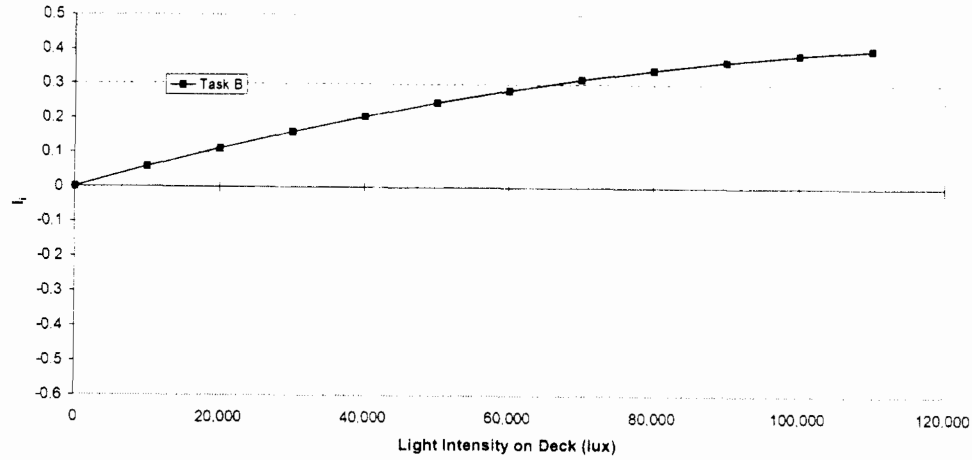


b. Superstructure

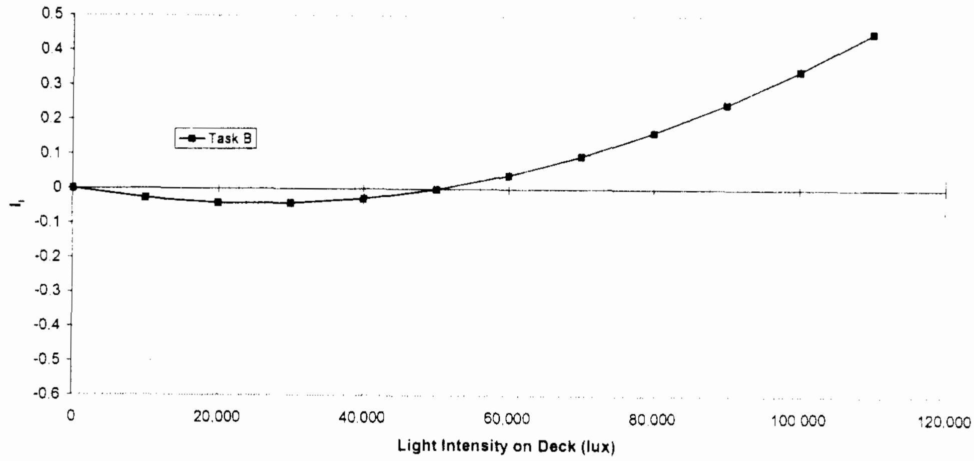


c. Substructure

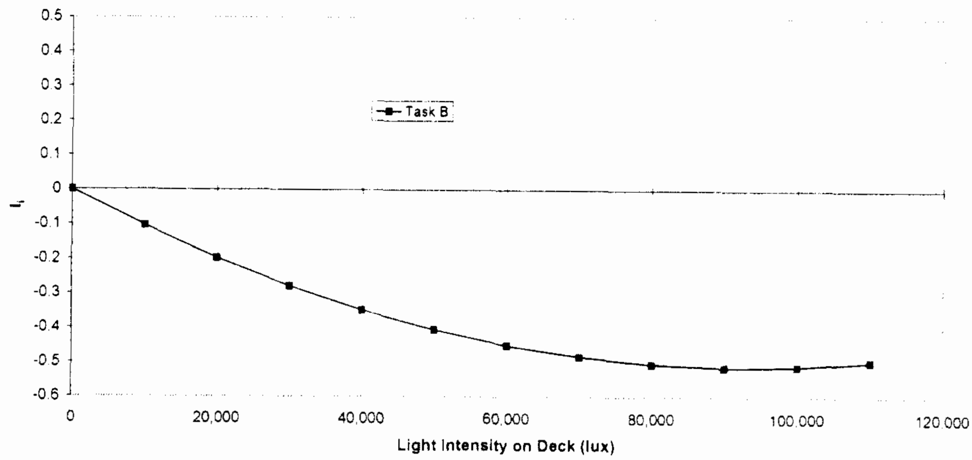
Figure L10. Influence of inspection factor Reported Observer Influence (1=No influence, 9=Great influence) on Condition Ratings.



a. Deck

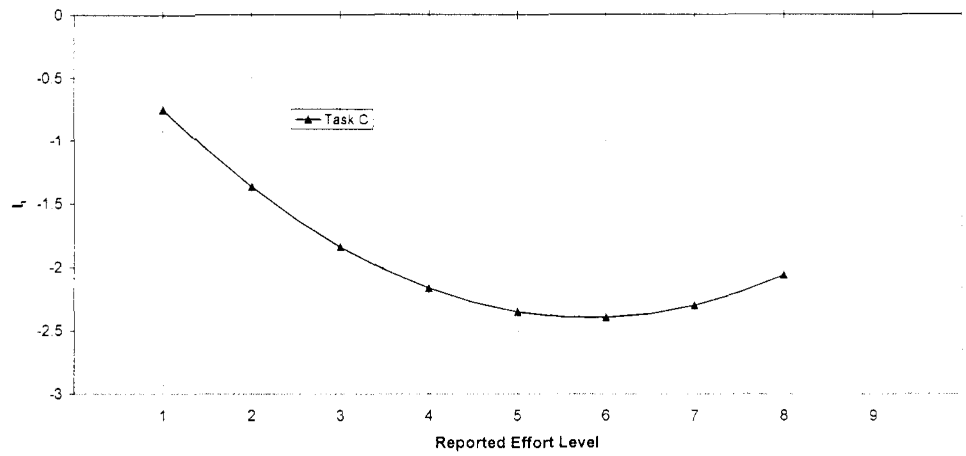


b. Superstructure

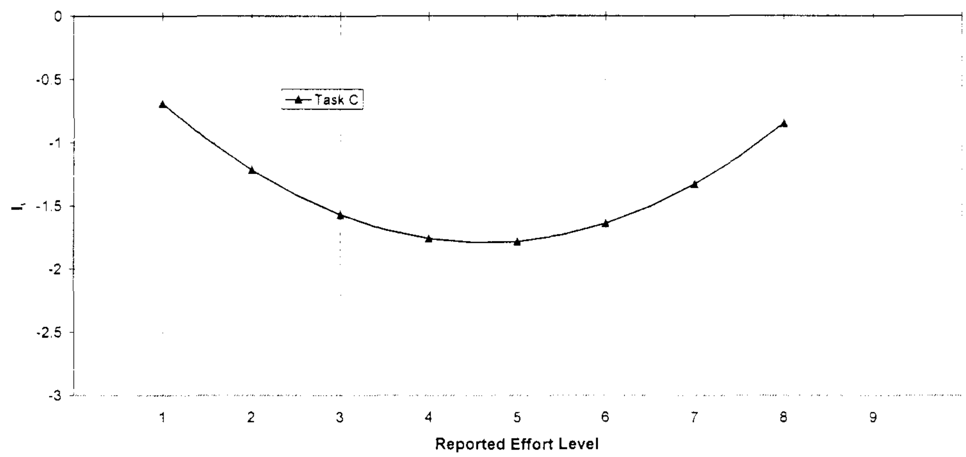


c. Substructure

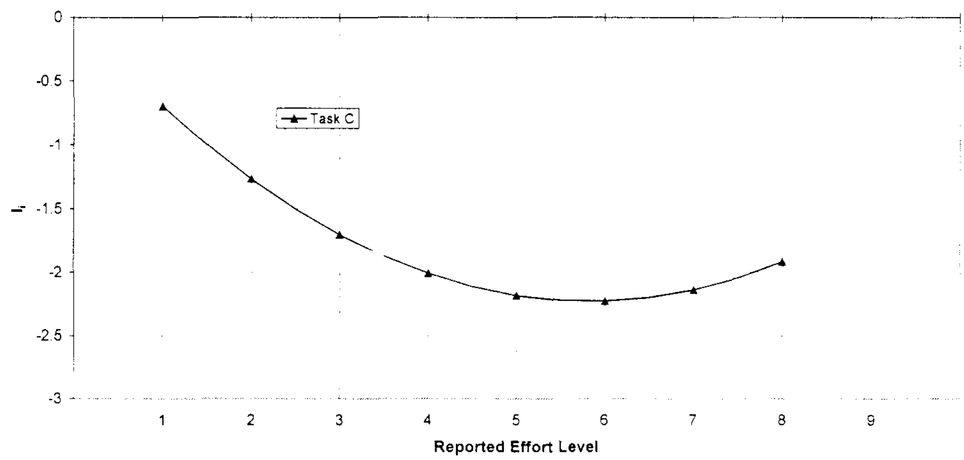
Figure L11. Influence of inspection factor Light Intensity on Deck on Condition Ratings.



a. Deck

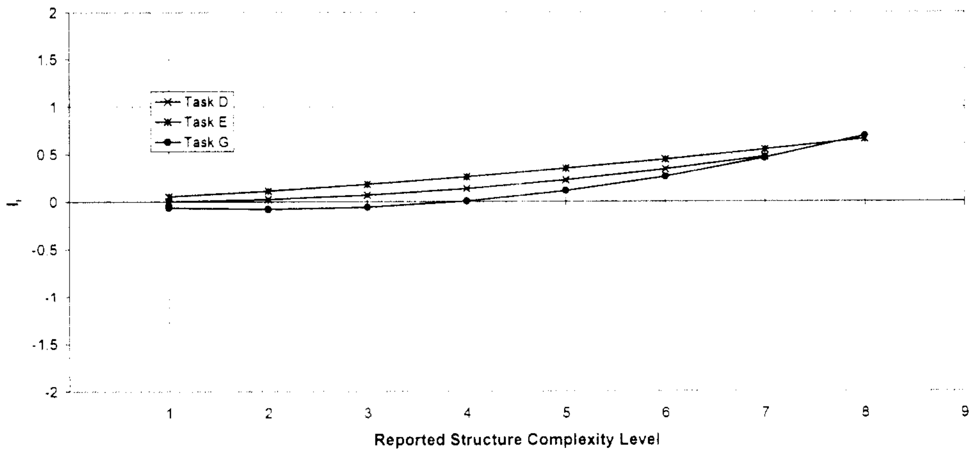


b. Superstructure

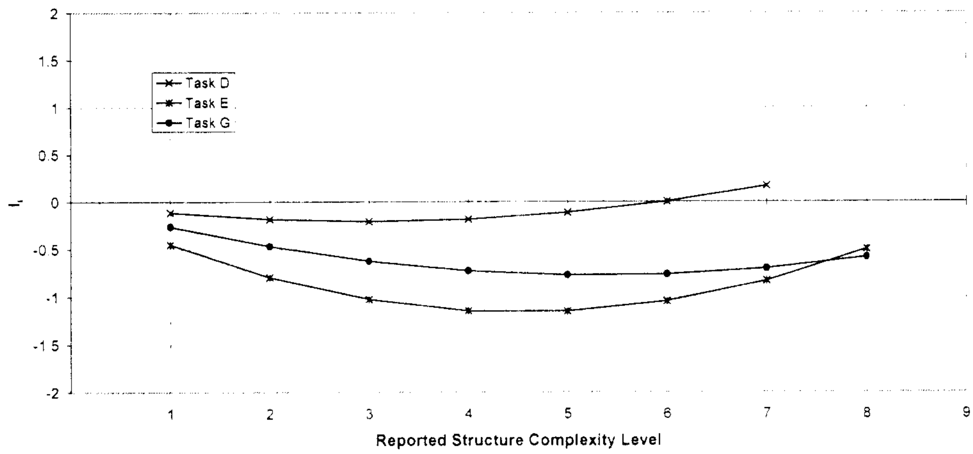


c. Substructure

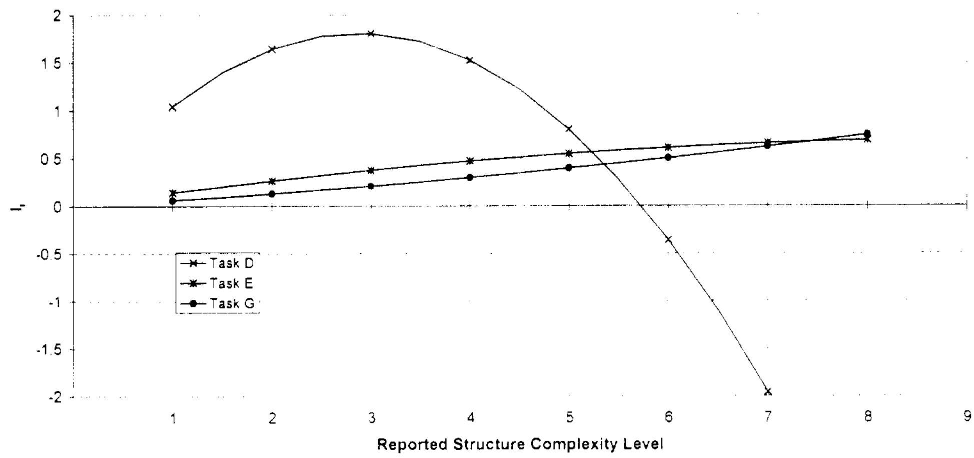
Figure L12. Influence of inspection factor Reported Effort Level (1=Much lower than normal, 9=Much greater than normal) on Condition Ratings.



a. Deck

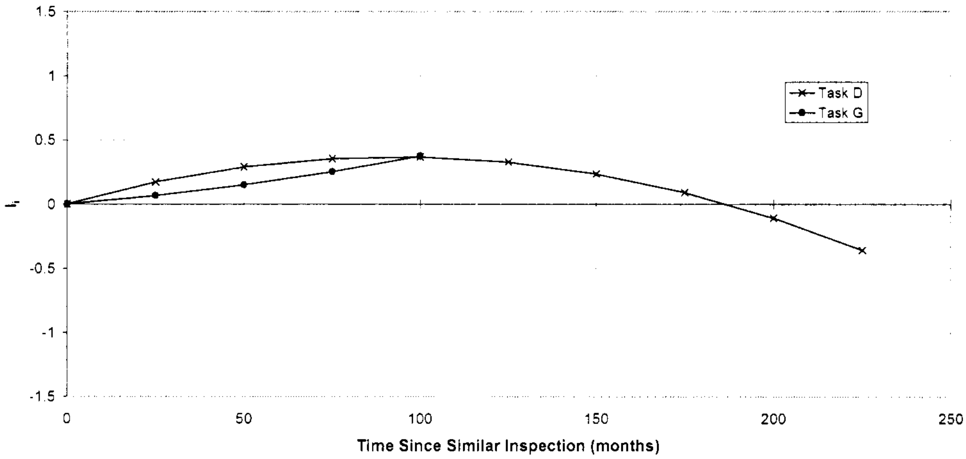


b. Superstructure



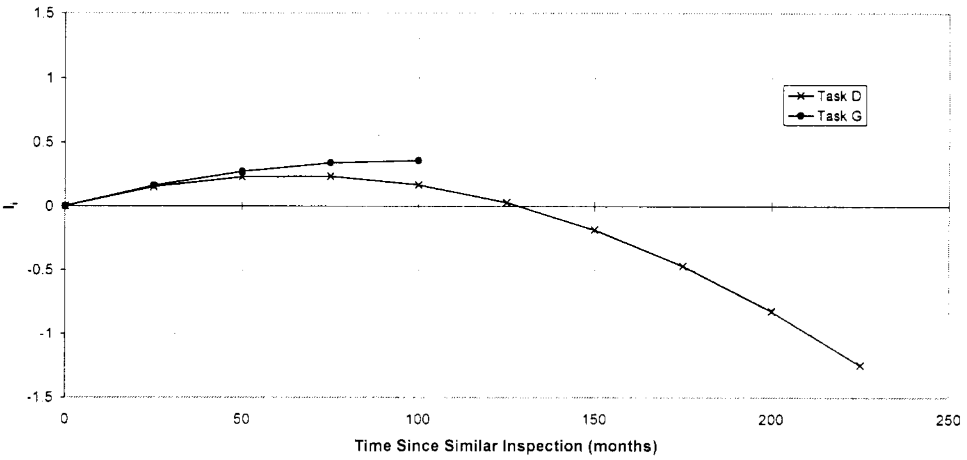
c. Substructure

Figure L13. Influence of inspection factor Reported Structure Complexity Level (1=Very simple, 9=Very complex) on Condition Ratings.



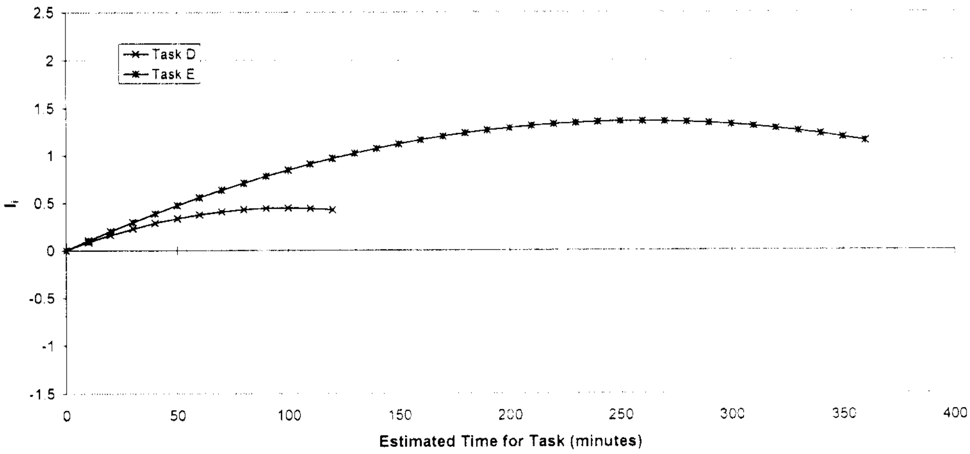
a. Deck

b. Superstructure

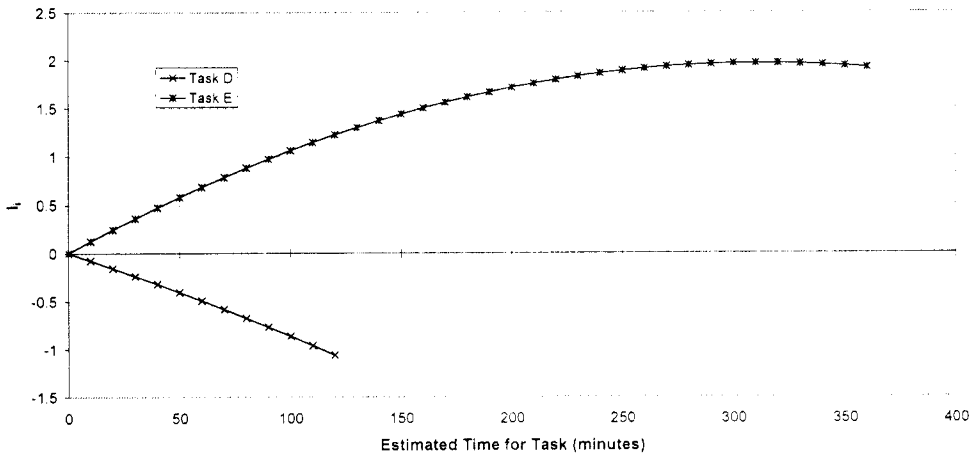


c. Substructure

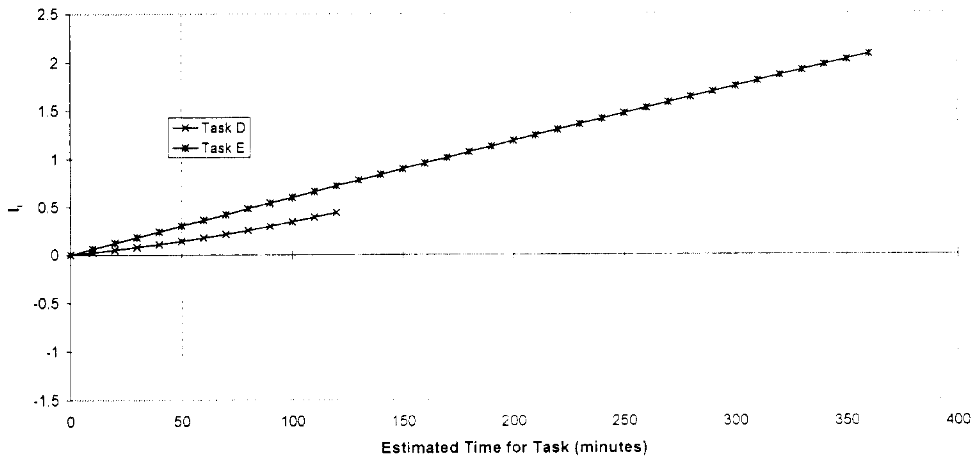
Figure L14. Influence of inspection factor Time Since Similar Inspection on Condition Ratings.



a. Deck

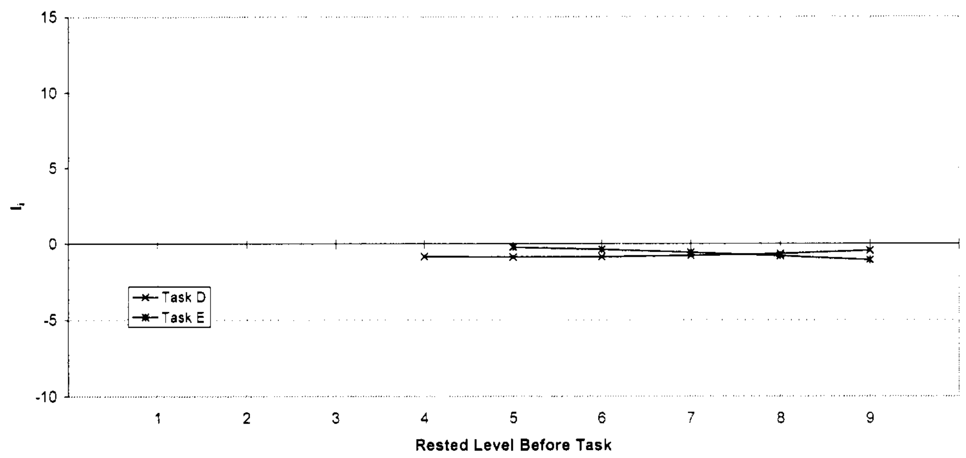


b. Superstructure

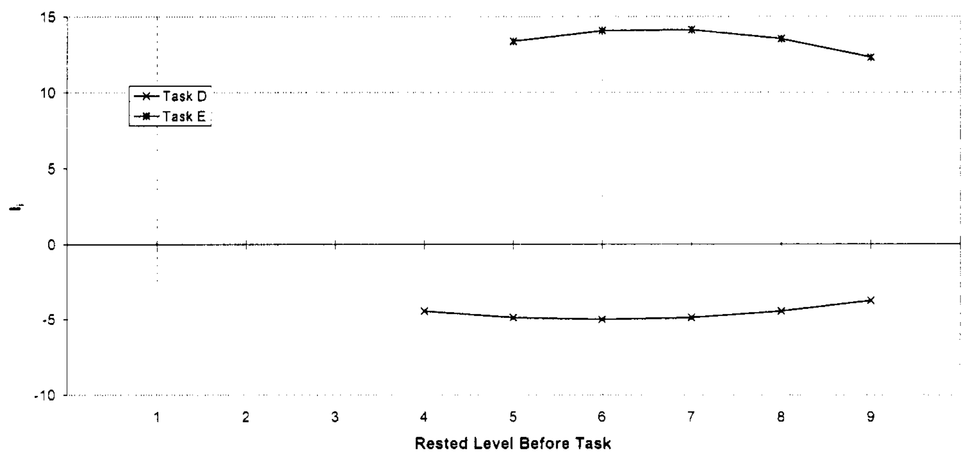


c. Substructure

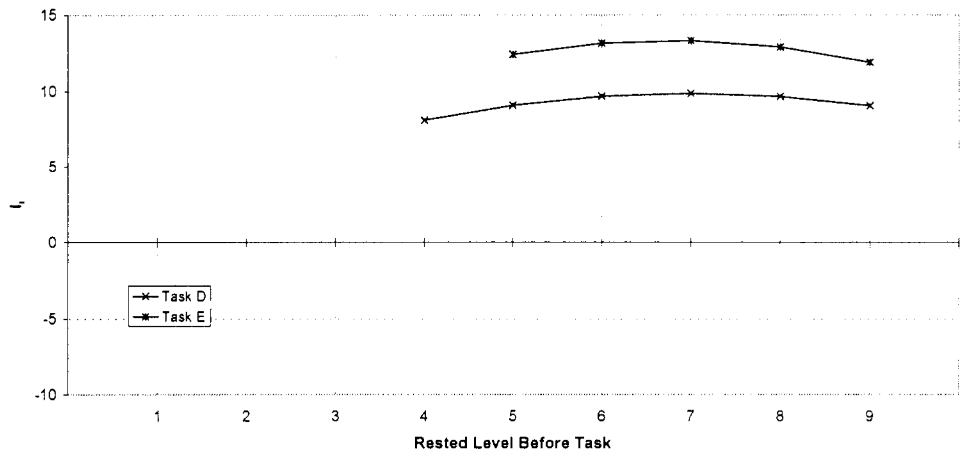
Figure L15. Influence of inspection factor Estimated Time for Task on Condition Ratings.



a. Deck

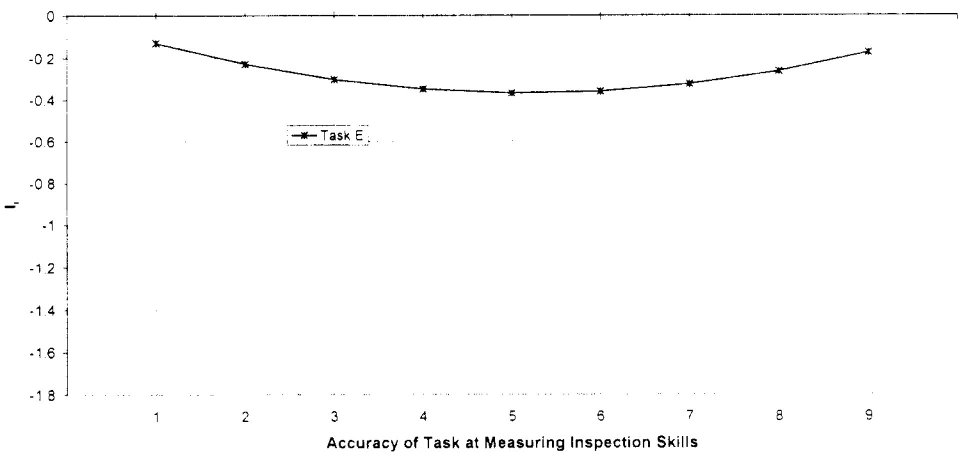


b. Superstructure

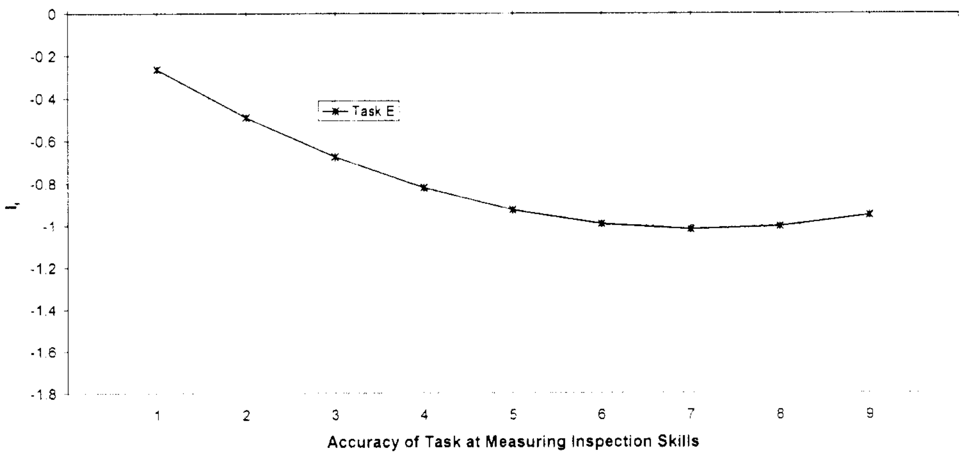


c. Substructure

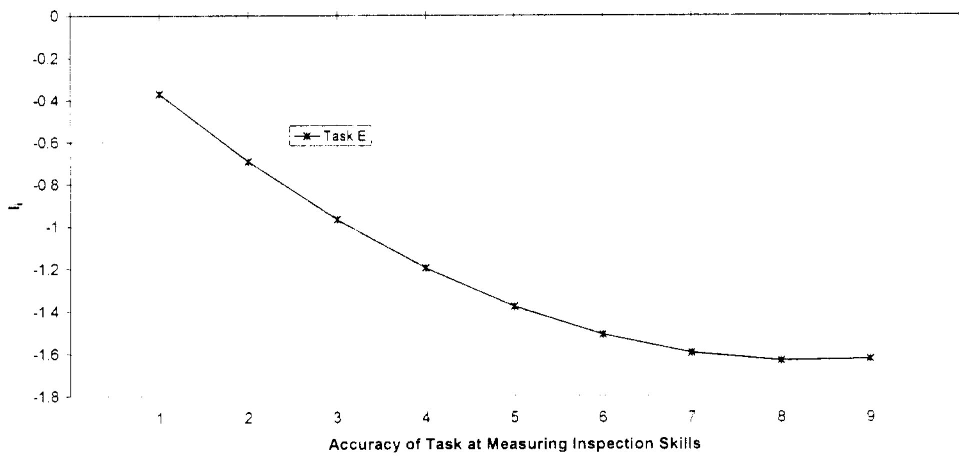
Figure L16. Influence of inspection factor Rested Level Before Task (1=Very tired, 9=Very rested) on Condition Ratings.



a. Deck

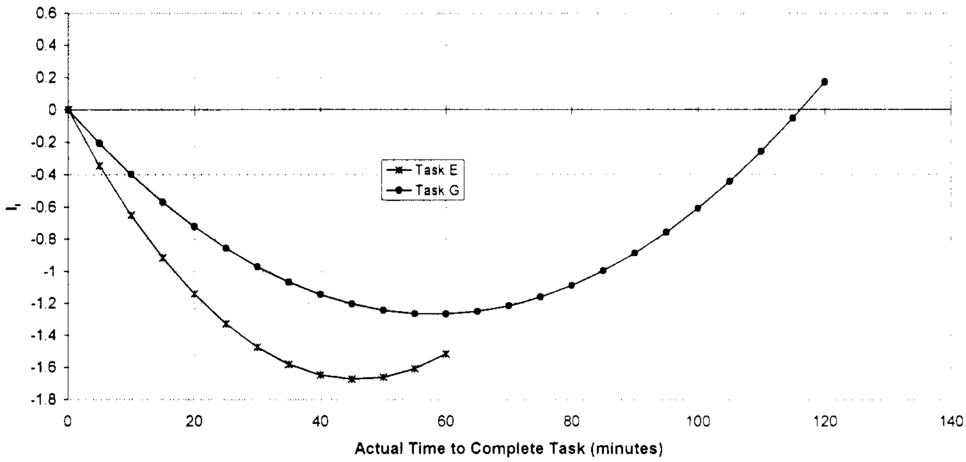


b. Superstructure

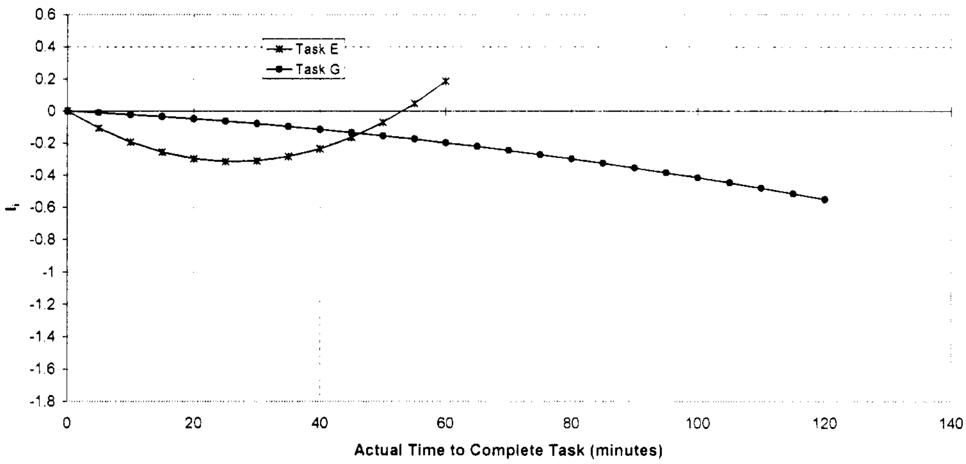


c. Substructure

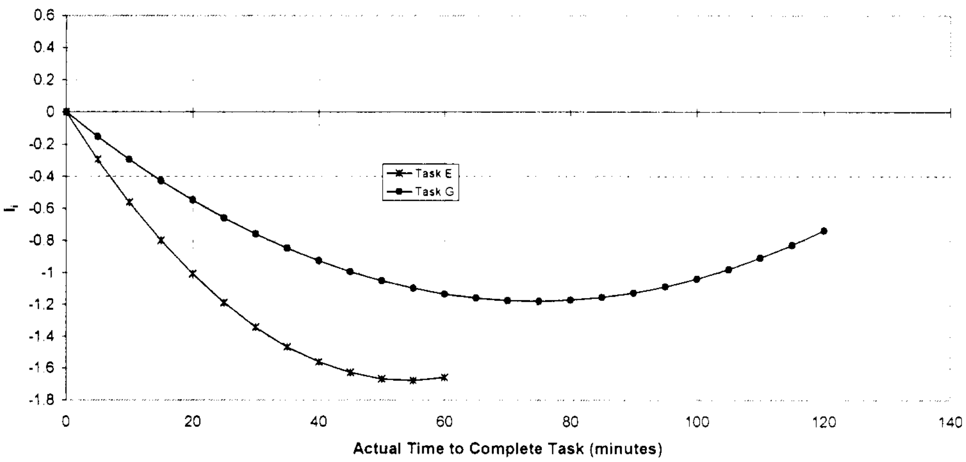
Figure L17. Influence of inspection factor Accuracy of Task at Measuring Inspection Skills (1=Very inaccurate, 9=Very accurate) on Condition Ratings.



a. Deck

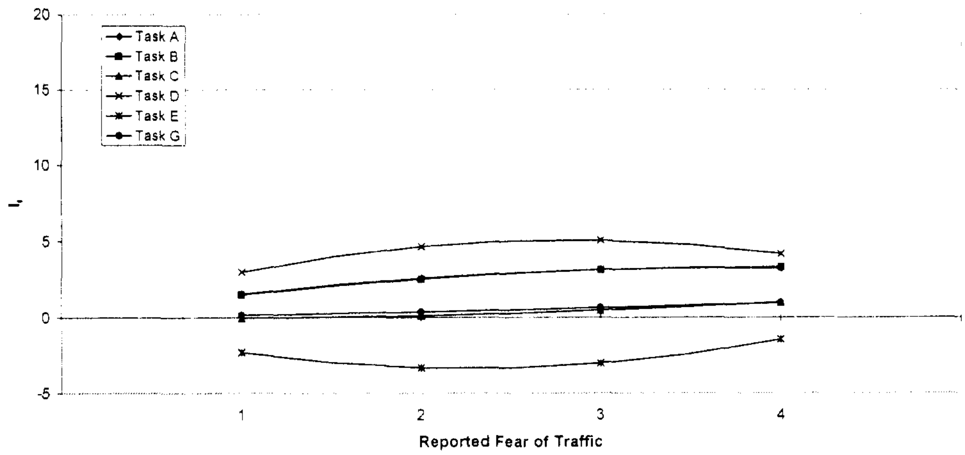


b. Superstructure

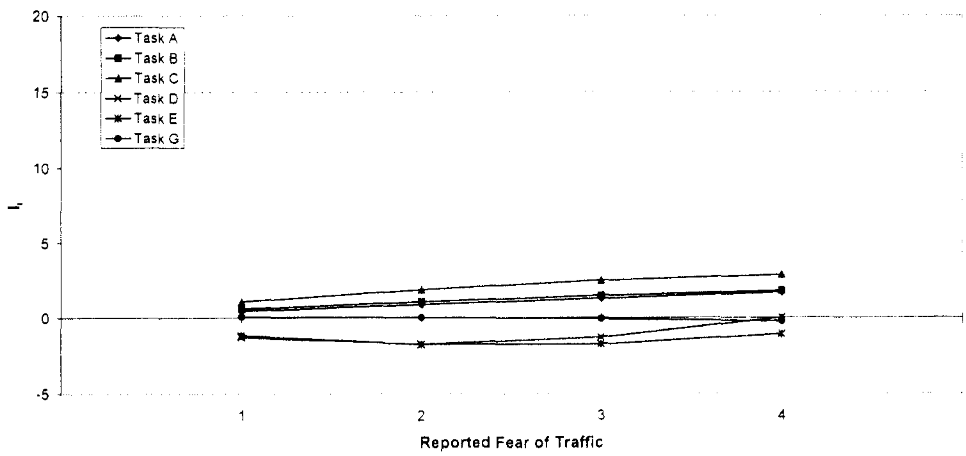


c. Substructure

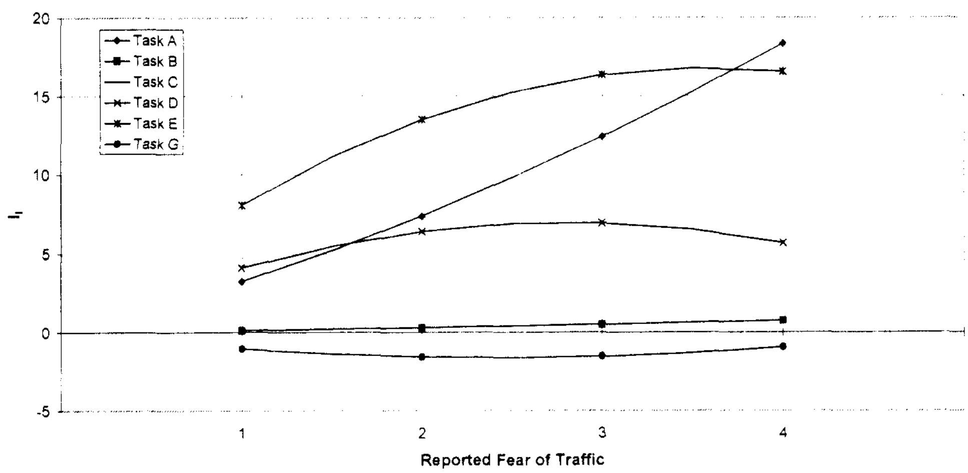
Figure L18. Influence of inspection factor Actual Time to Complete Task on Condition Ratings.



a. Deck

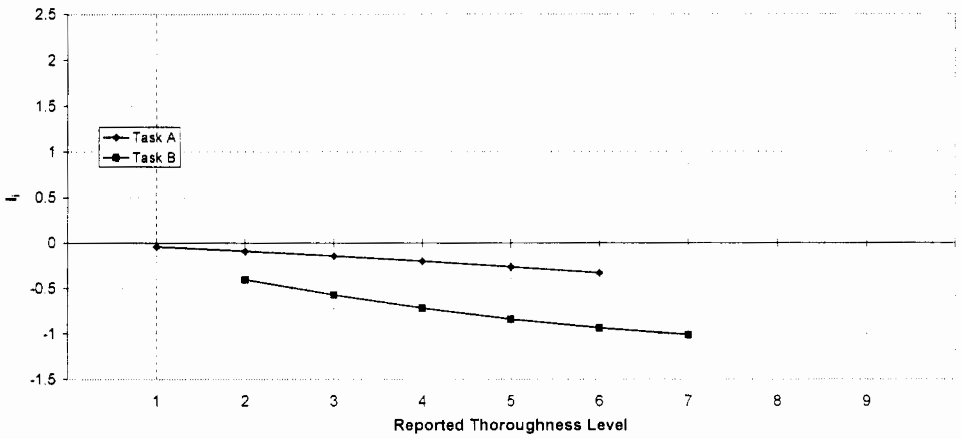


b. Superstructure

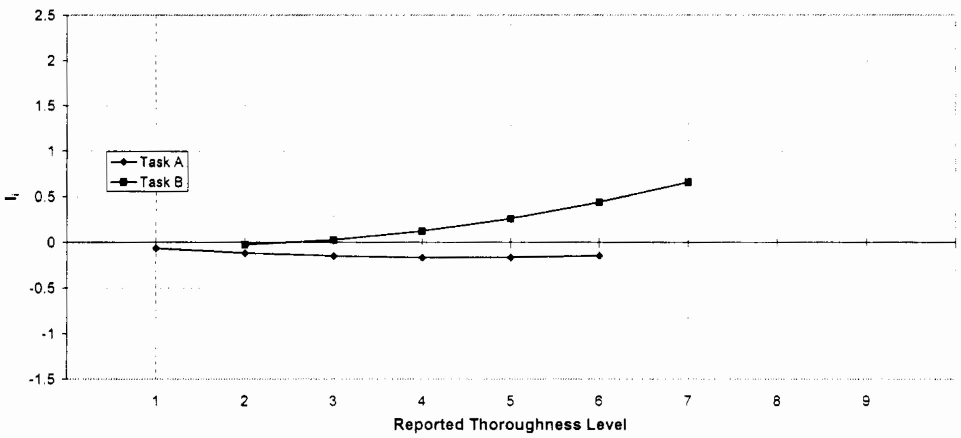


c. Substructure

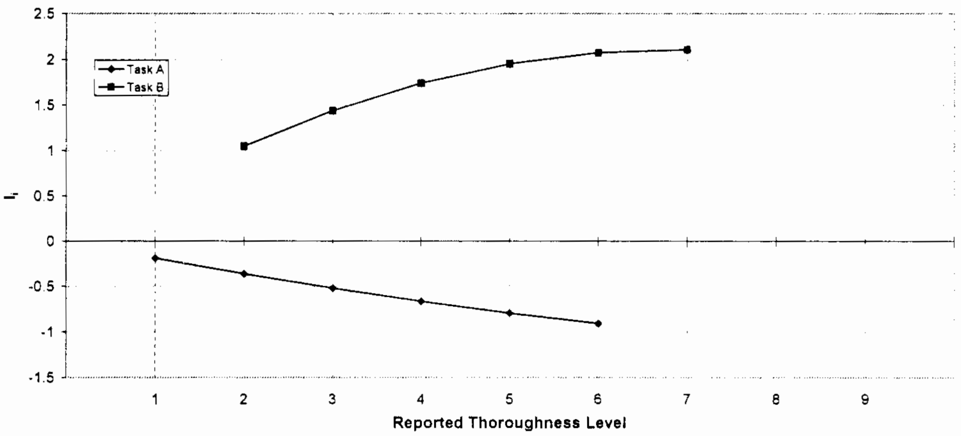
Figure L19. Influence of combined inspector/inspection factor Reported Fear of Traffic (1=Very fearful, 4=No fear) on Condition Ratings.



a. Deck

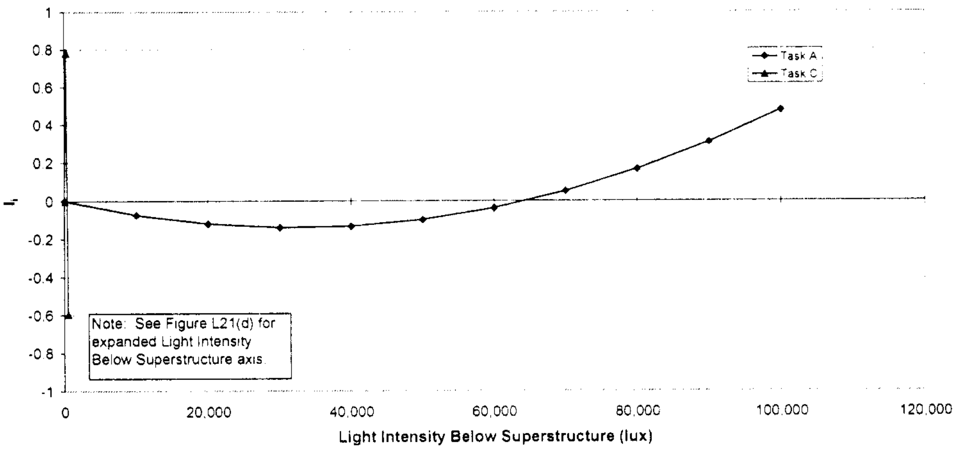


b. Superstructure

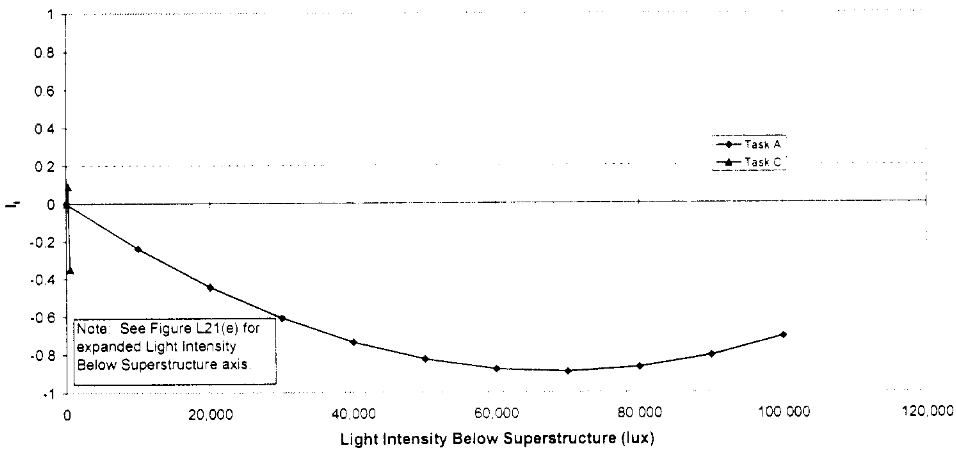


c. Substructure

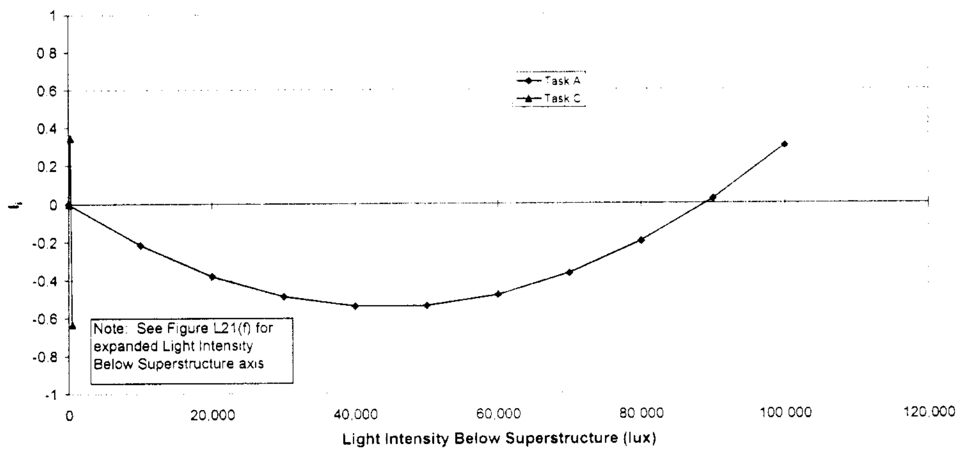
Figure L20. Influence of combined inspector/inspection factor Reported Thoroughness Level (1=Less thorough than normal, 9=More thorough than normal) on Condition Ratings.



a. Deck

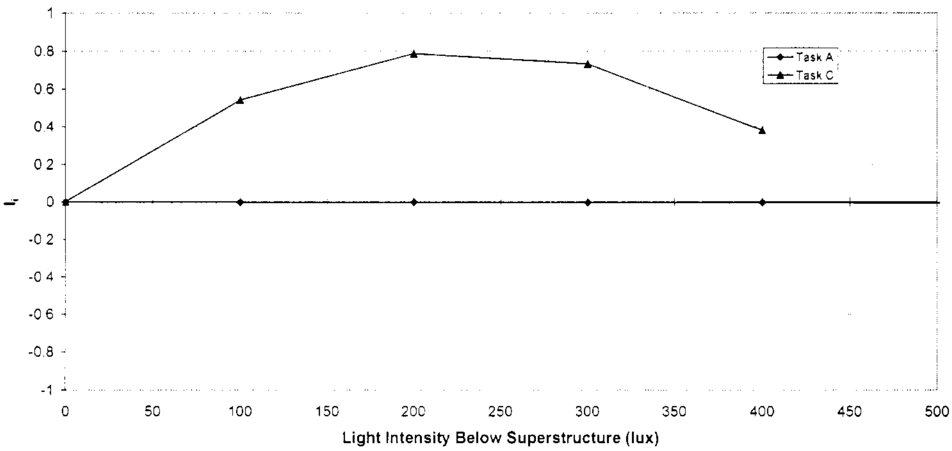


b. Superstructure

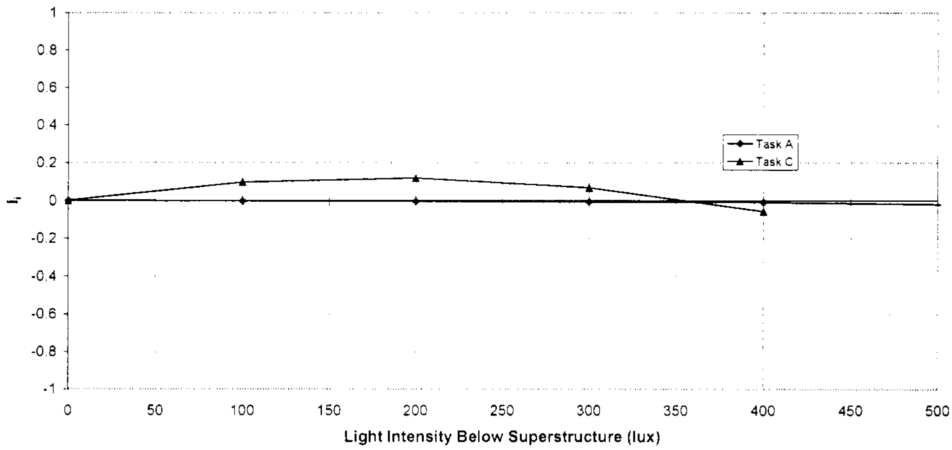


c. Substructure

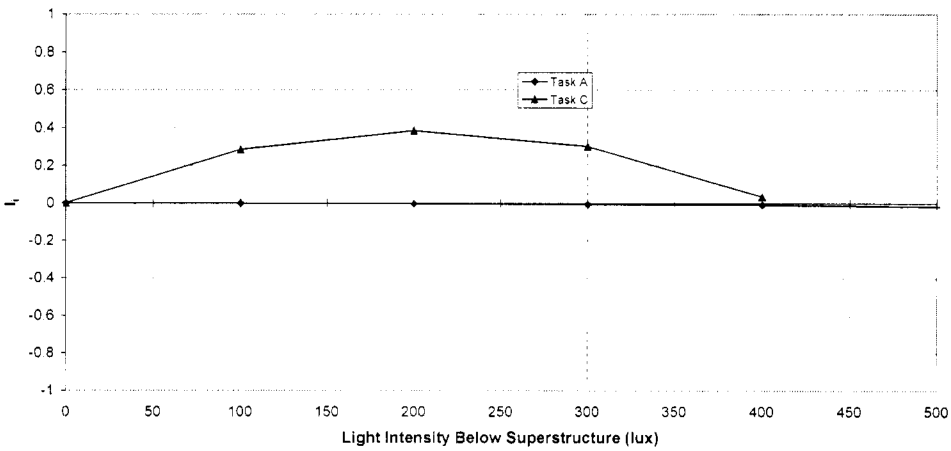
Figure L21. Influence of combined inspector/inspection factor Light Intensity Below Superstructure on Condition Ratings.



d. Deck

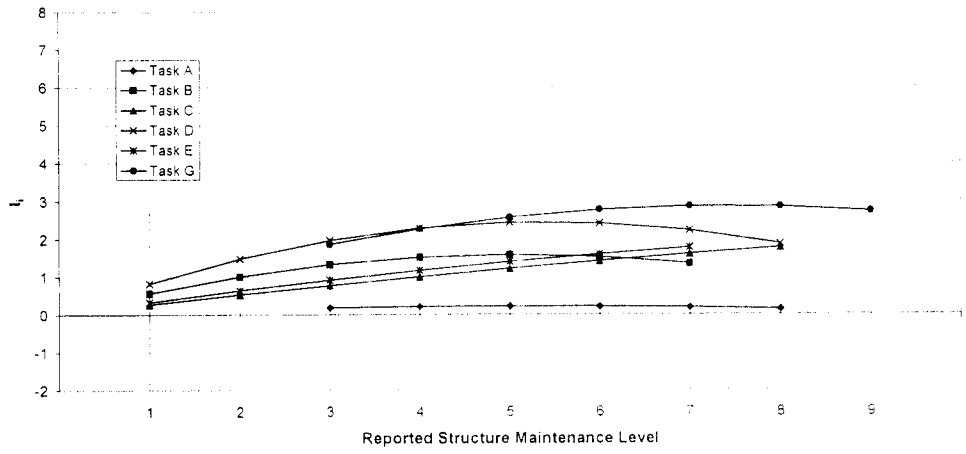


e. Superstructure

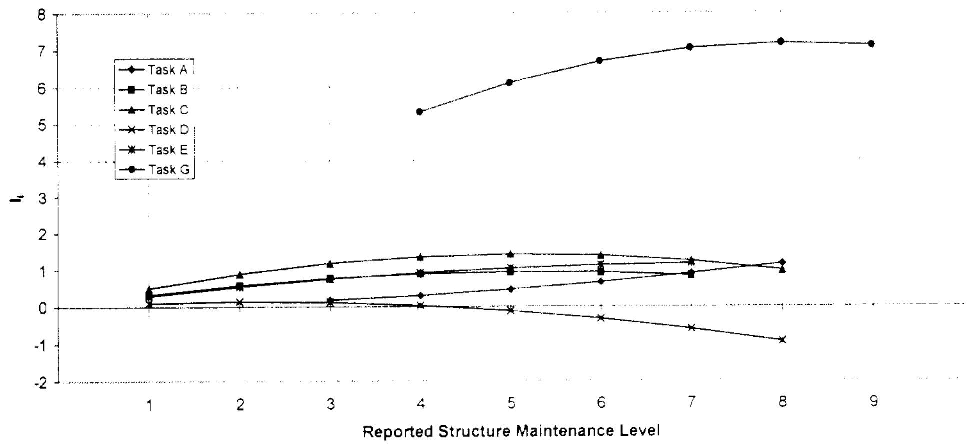


f. Substructure

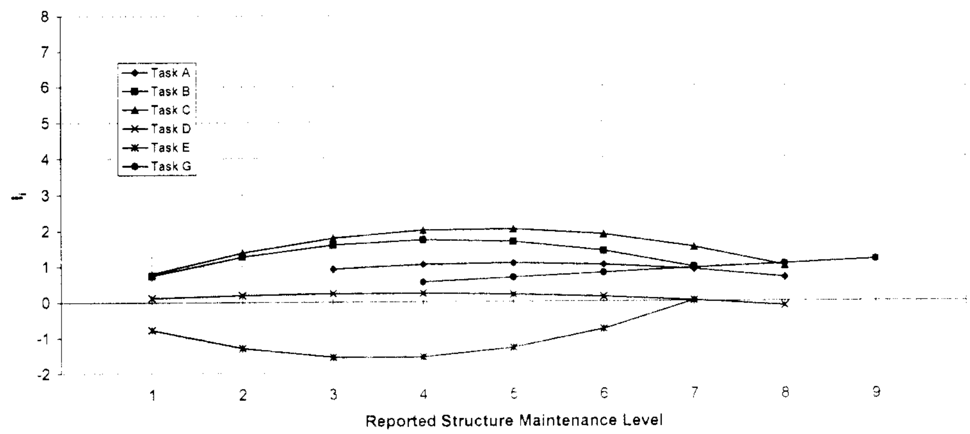
Figure L21. Influence of combined inspector/inspection factor Light Intensity Below Superstructure on Condition Ratings (continued).



a. Deck

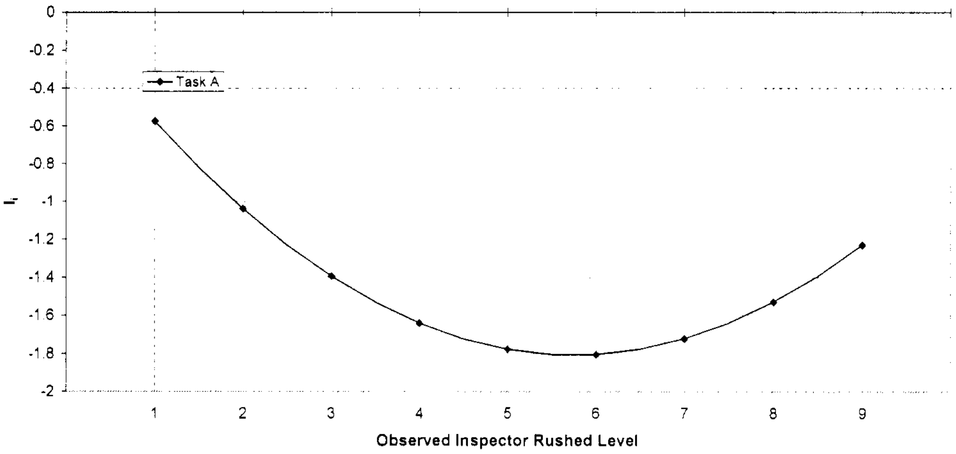


b. Superstructure

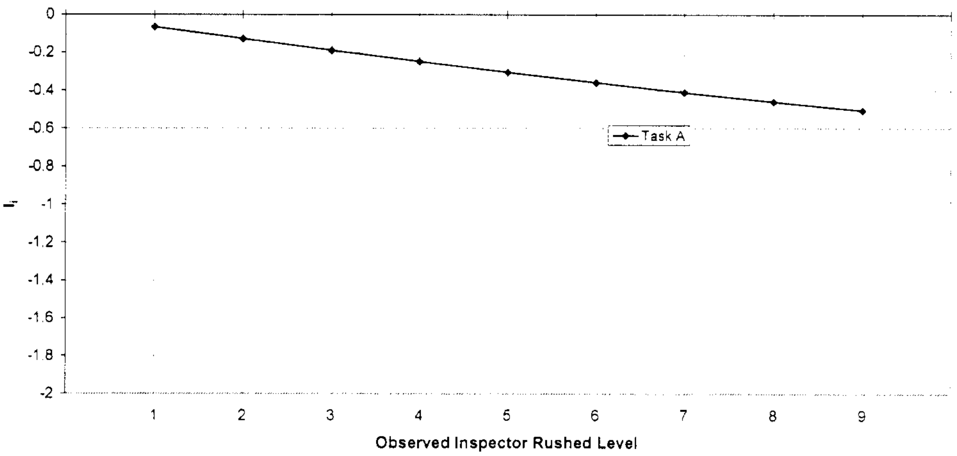


c. Substructure

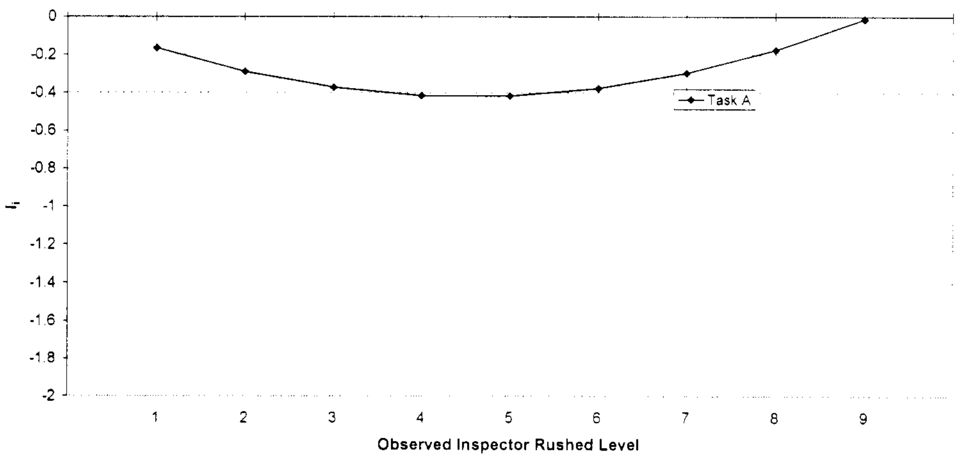
Figure L22. Influence of combined inspector/inspection factor Reported Structure Maintenance Level (1=Very poorly, 9=Very well) on Condition Ratings.



a. Deck

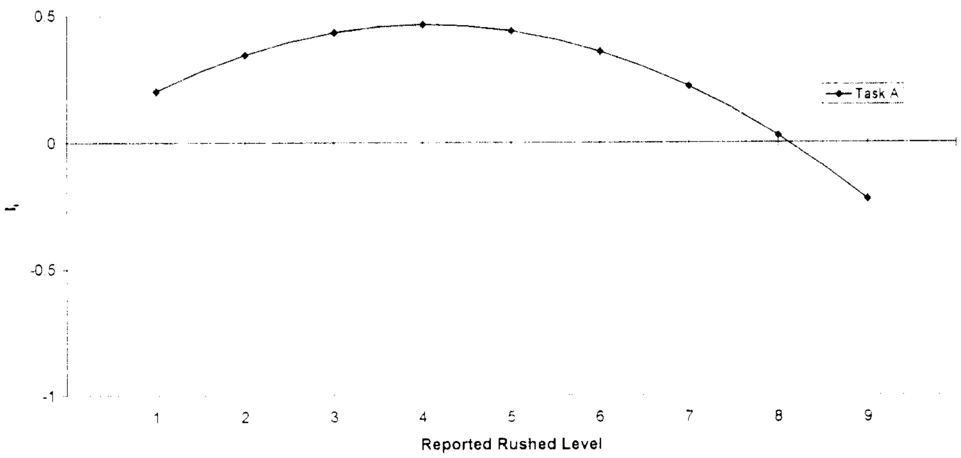


b. Superstructure

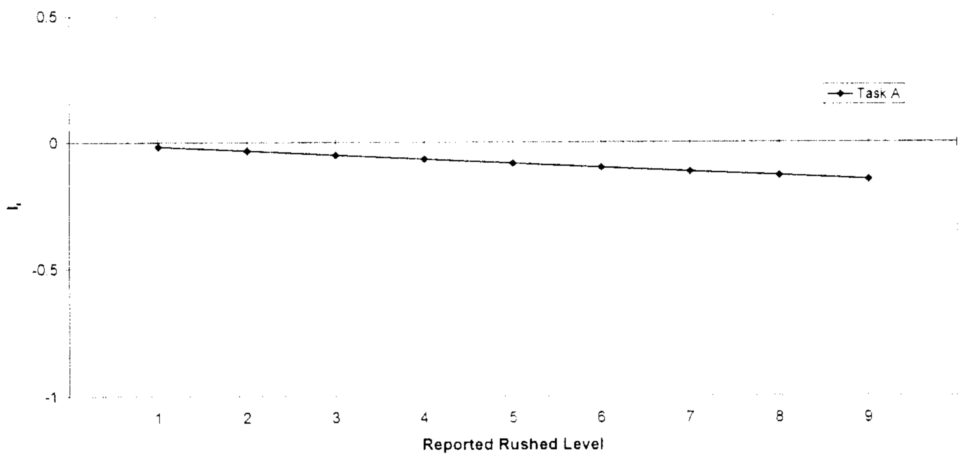


c. Substructure

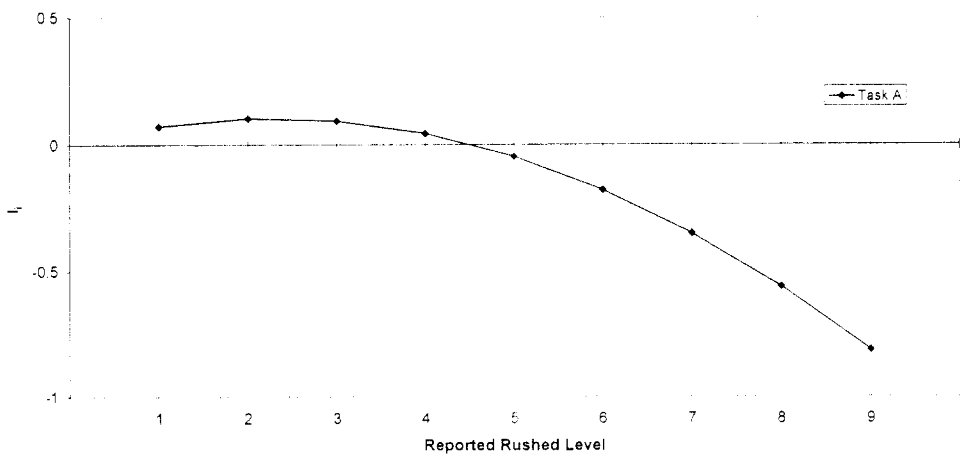
Figure L23. Influence of combined inspector/inspection factor Observed Inspector Rushed Level (1=Not rushed, 9=Very rushed) on Condition Ratings.



a. Deck

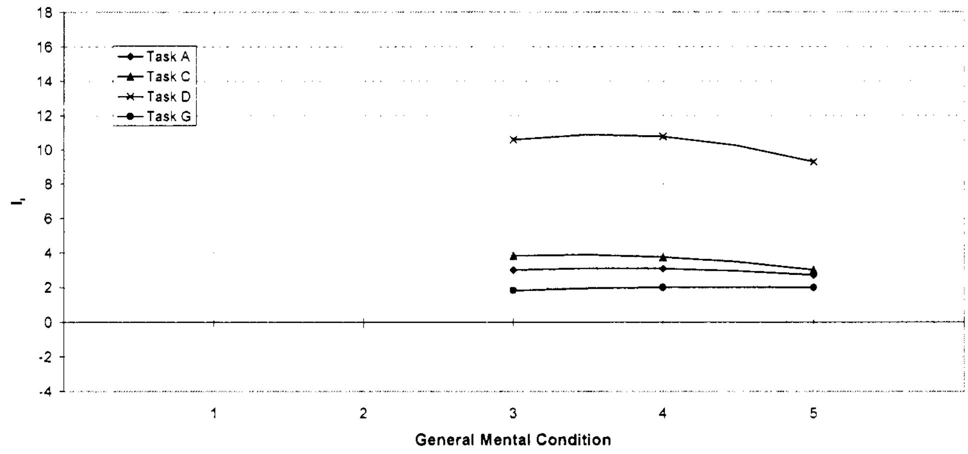


b. Superstructure

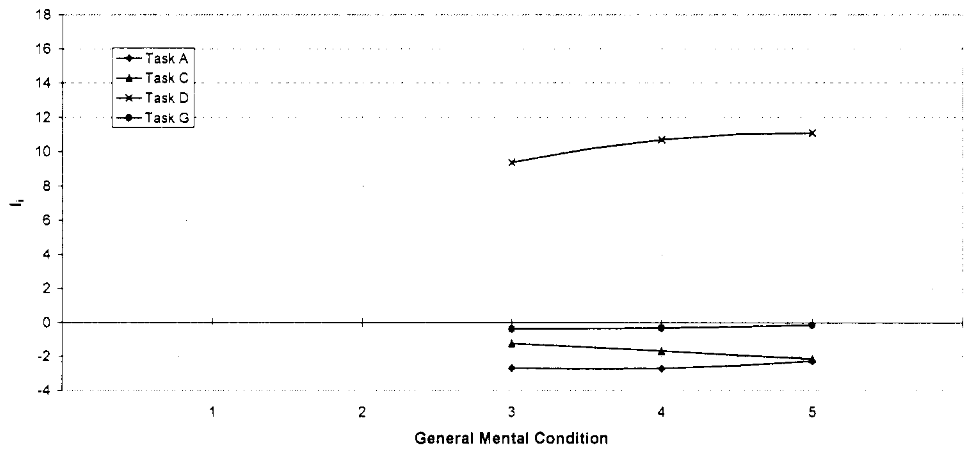


c. Substructure

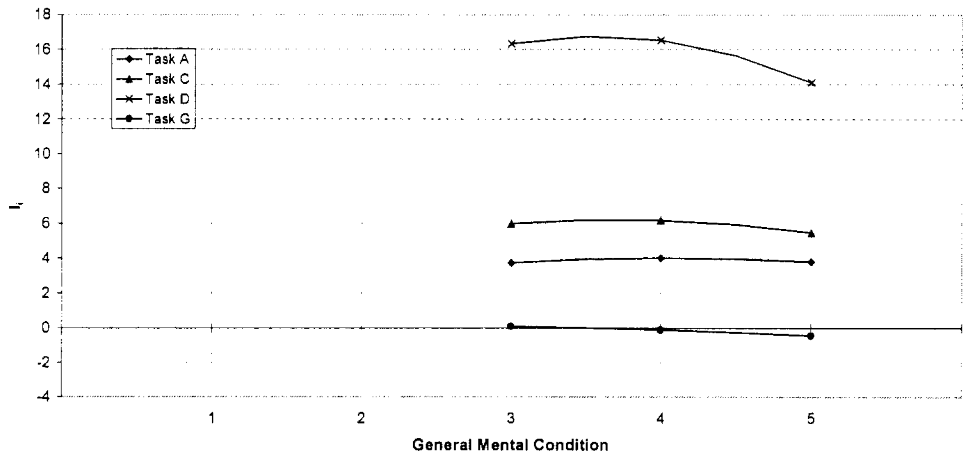
Figure L24. Influence of combined inspector/inspection factor Reported Rushed Level (1=Not rushed, 9=Very rushed) on Condition Ratings.



a. Deck

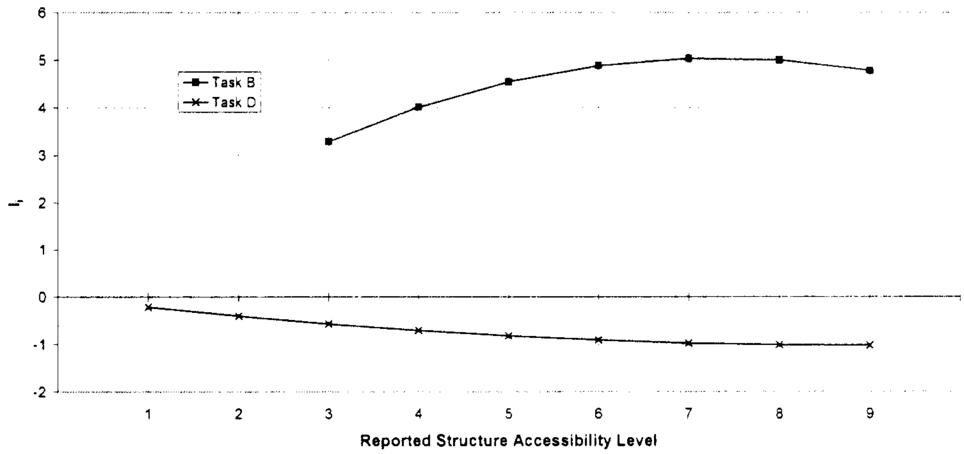


b. Superstructure

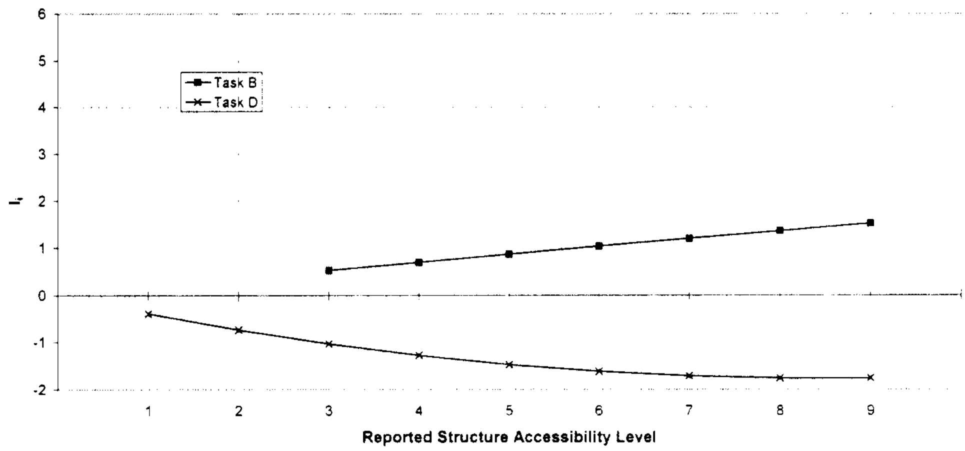


c. Substructure

Figure L25. Influence of combined inspector/inspection factor General Mental Condition (1=Poor, 5=Superior) on Condition Ratings.



a. Deck



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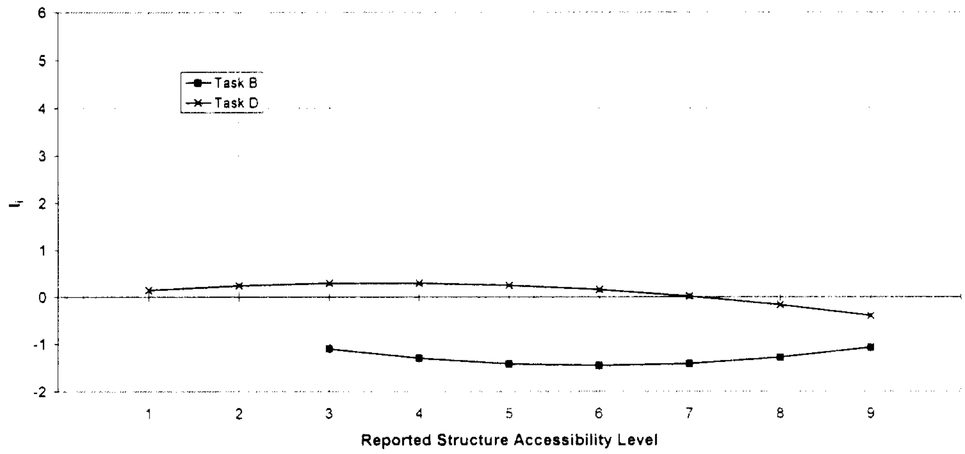
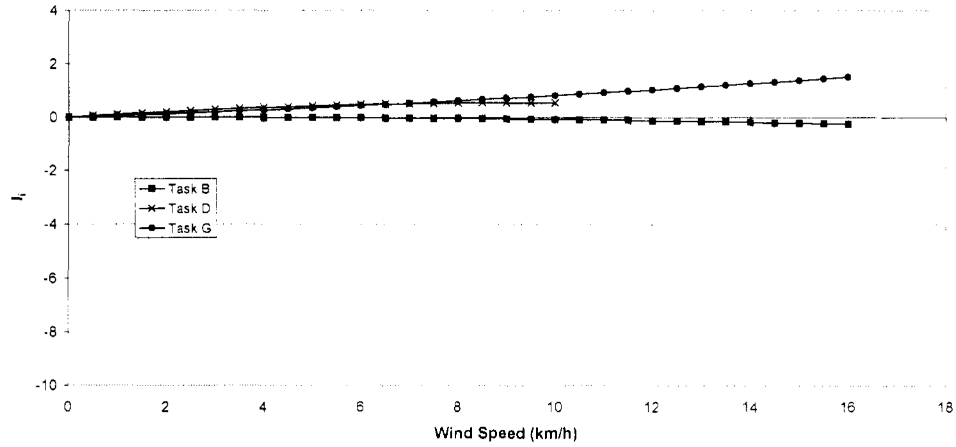
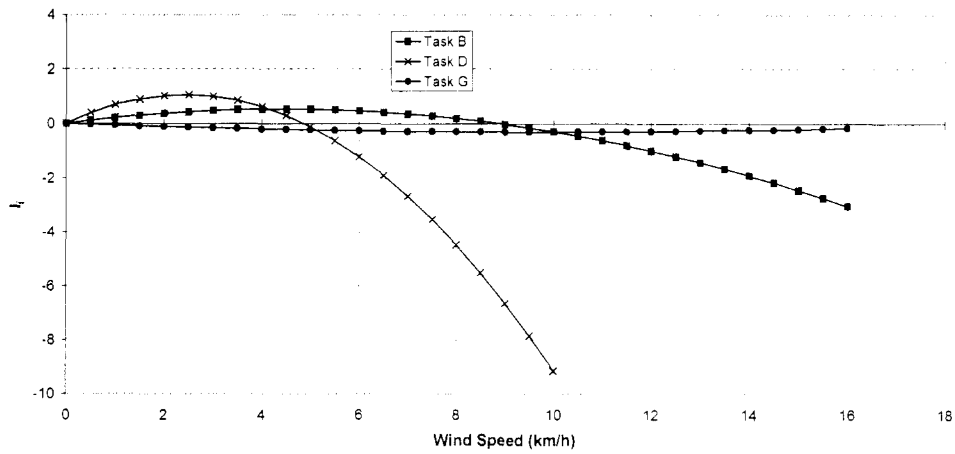


c. Substructure

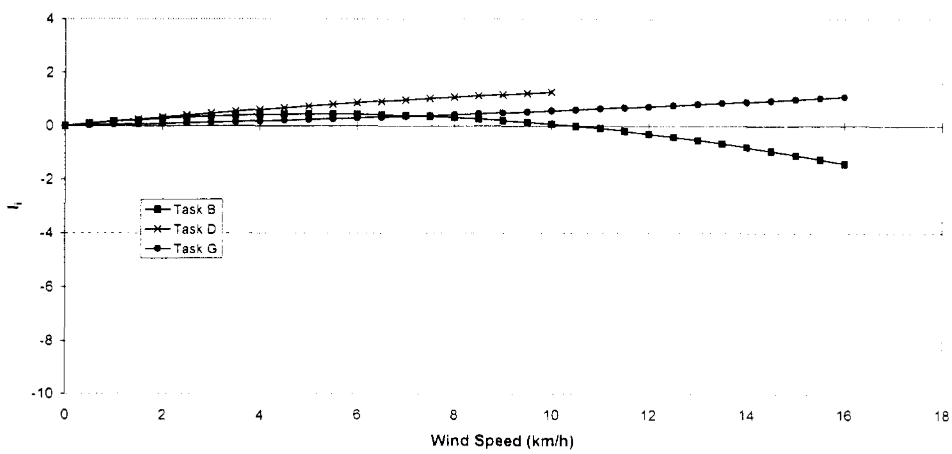
Figure L26. Influence of combined inspector/inspection factor Reported Structure Accessibility Level (1=Very inaccessible, 9=Very accessible) on Condition Ratings.



a. Deck

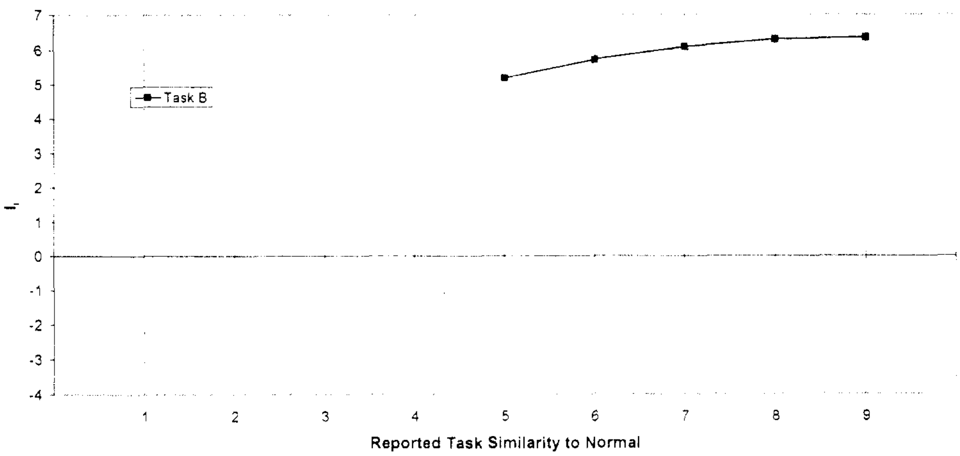


b. Superstructure

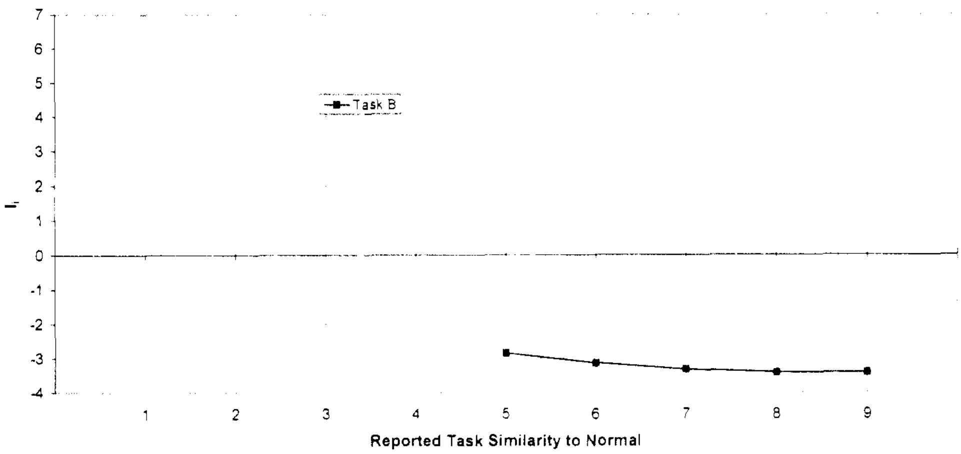


c. Substructure

Figure L27. Influence of combined inspector/inspection factor Wind Speed on Condition Ratings.



a. Deck



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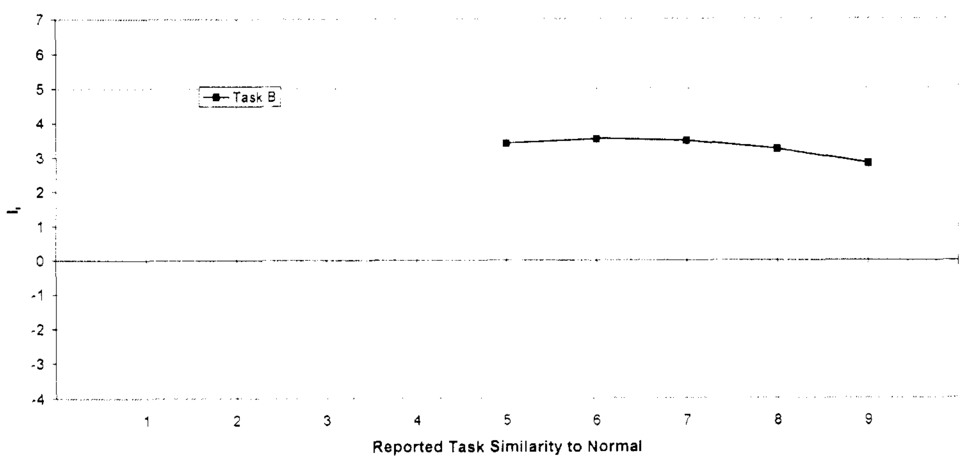
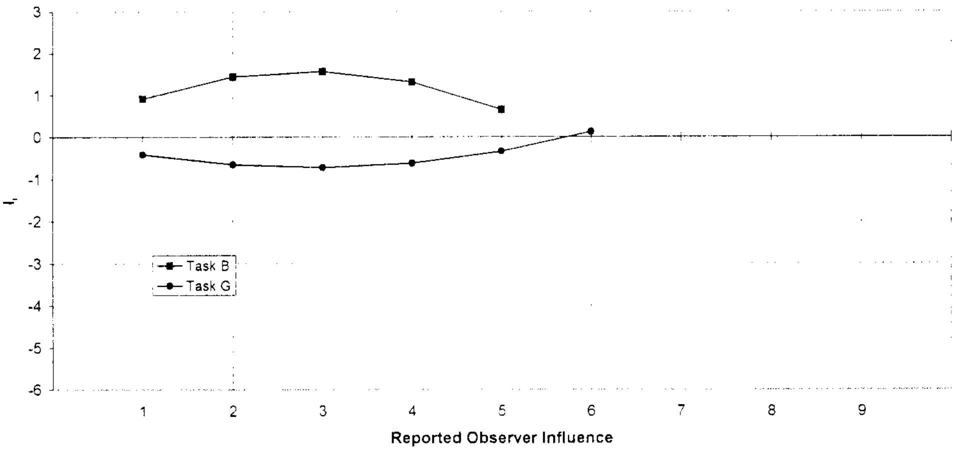
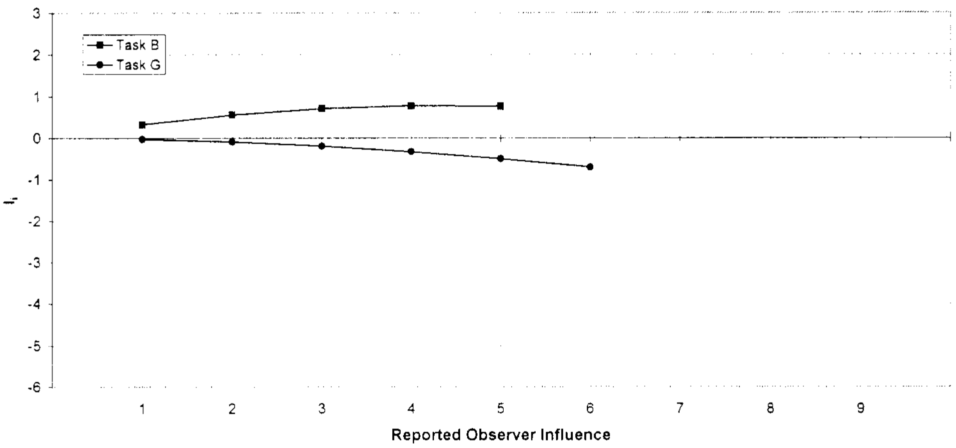


c. Substructure

Figure L28. Influence of combined inspector/inspection factor Reported Task Similarity to Normal (1=Not similar, 9=Very similar) on Condition Ratings.



a. Deck



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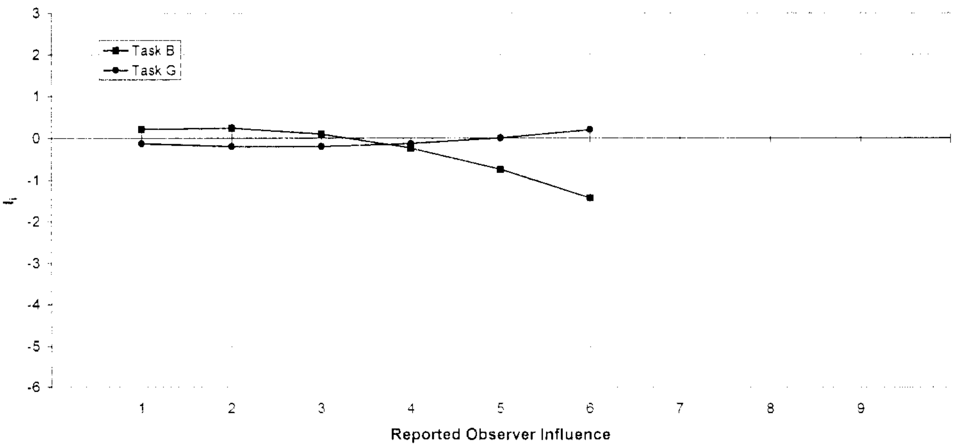
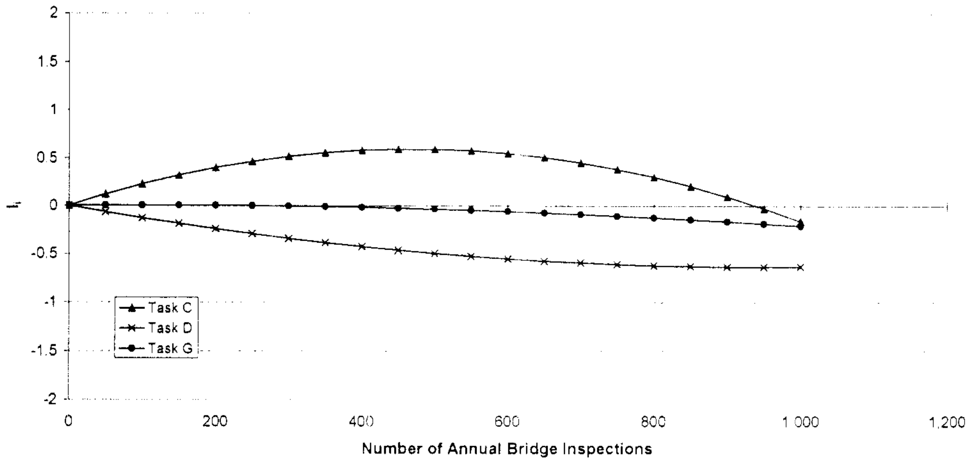
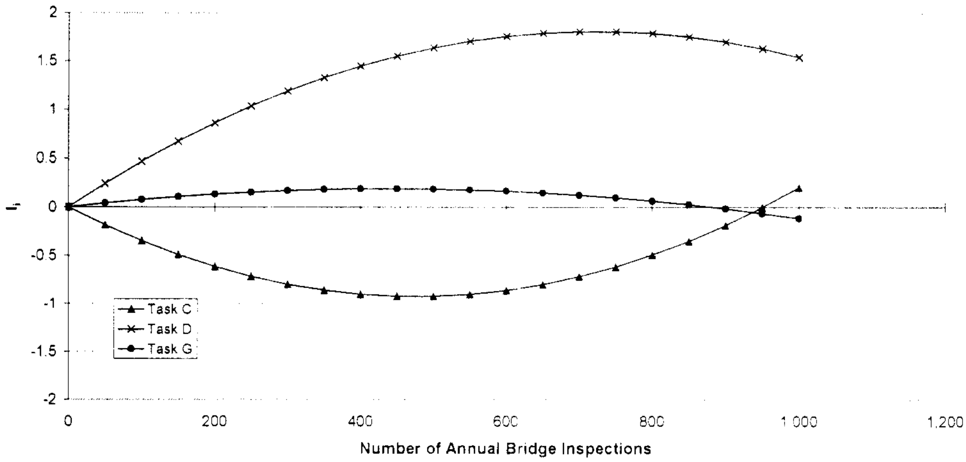


c. Substructure

Figure L29. Influence of combined inspector/inspection factor Reported Observer Influence (1=No influence, 9=Great influence) on Condition Ratings.



a. Deck



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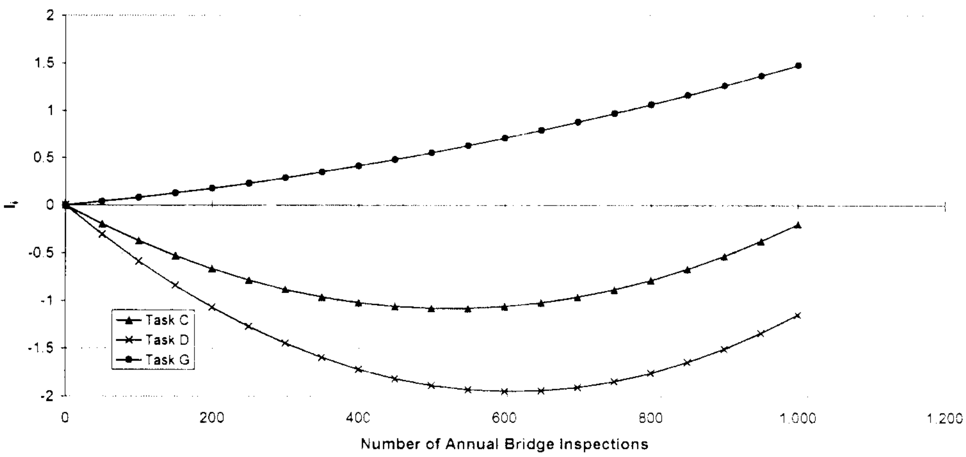
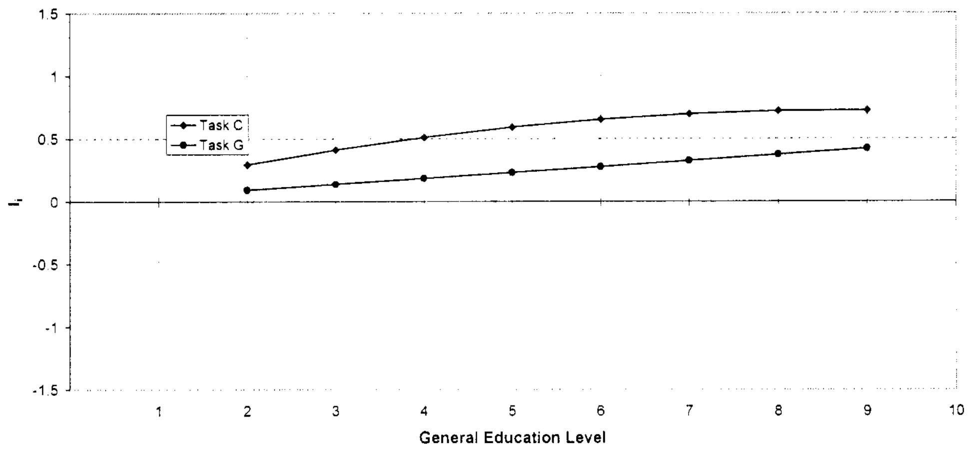
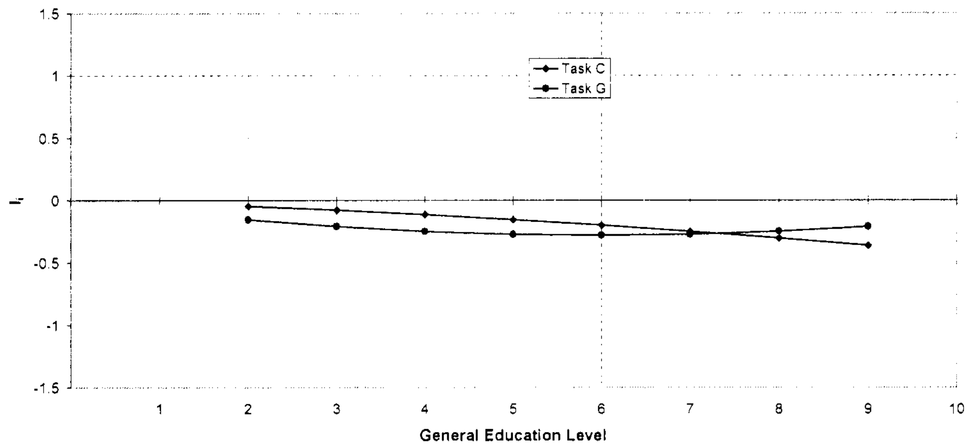


c. Substructure

Figure L30. Influence of combined inspector/inspection factor Number of Annual Bridge Inspections on Condition Ratings.



a. Deck



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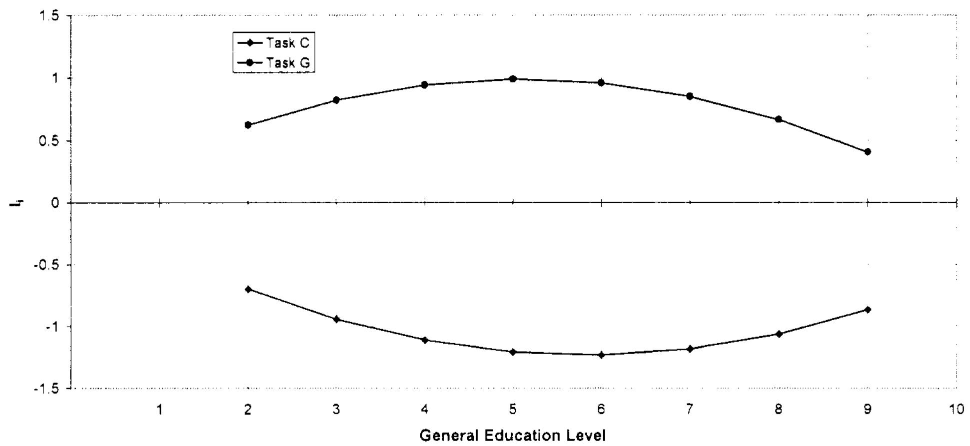
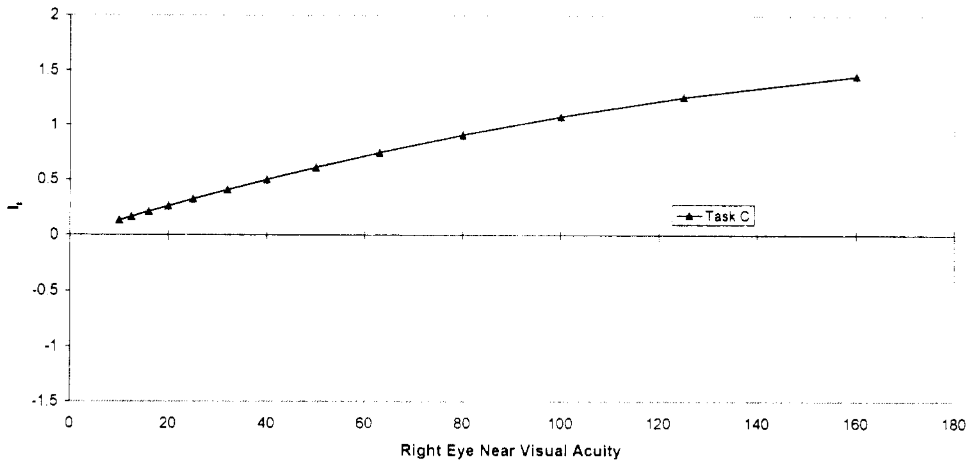
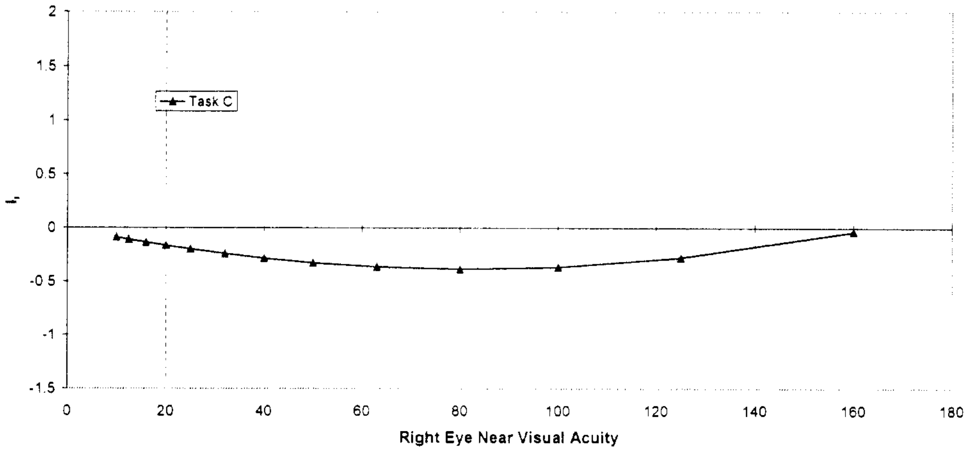


c. Substructure

Figure L31. Influence of combined inspector/inspection factor General Education Level (1=Some high school, 10=Terminal degree) on Condition Ratings.



a. Deck



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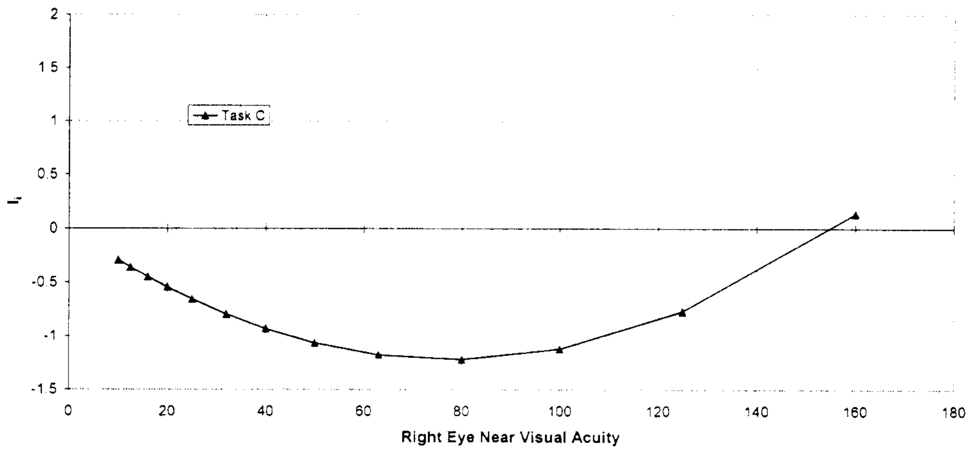
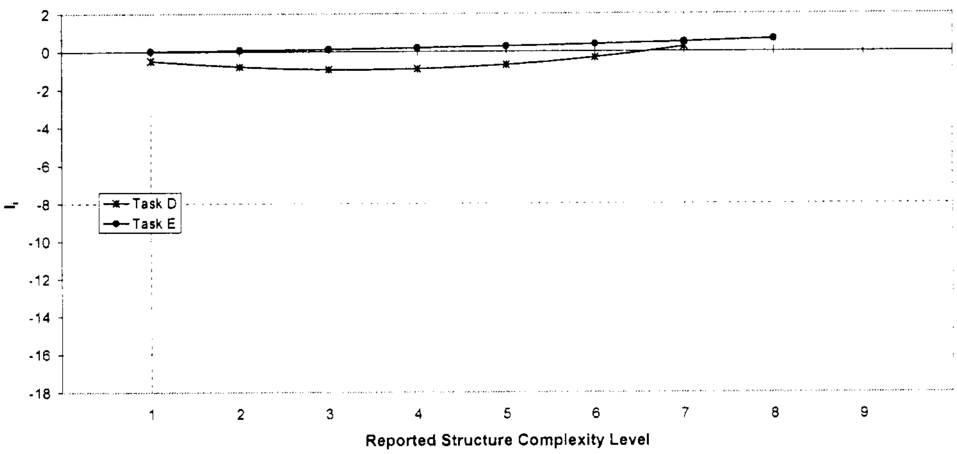


c. Substructure

Figure L32. Influence of combined inspector/inspection factor Right Eye Near Visual Acuity on Condition Ratings.



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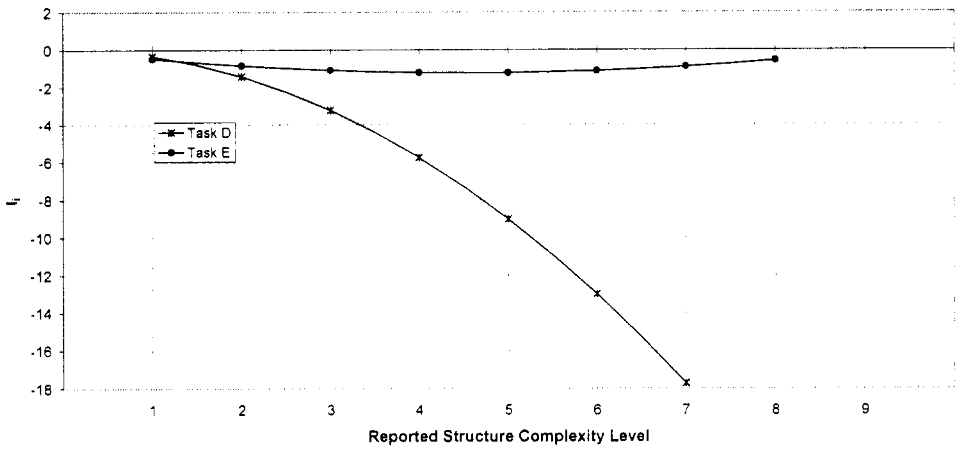

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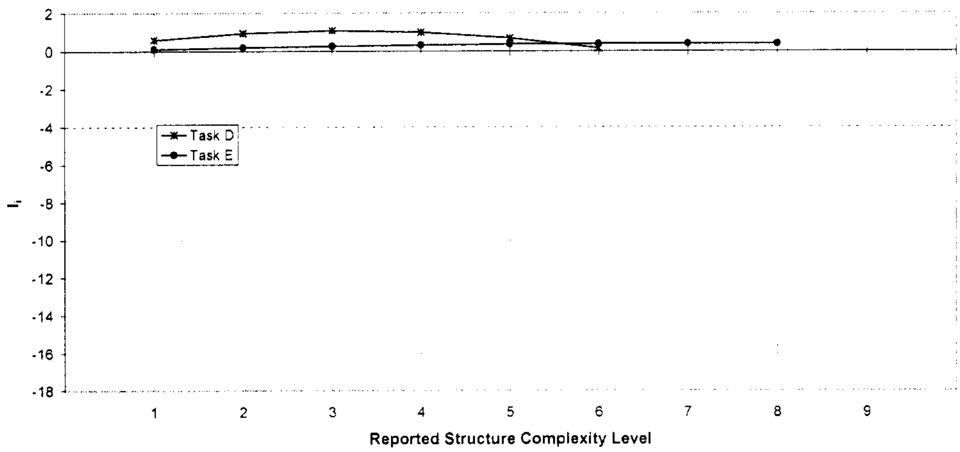
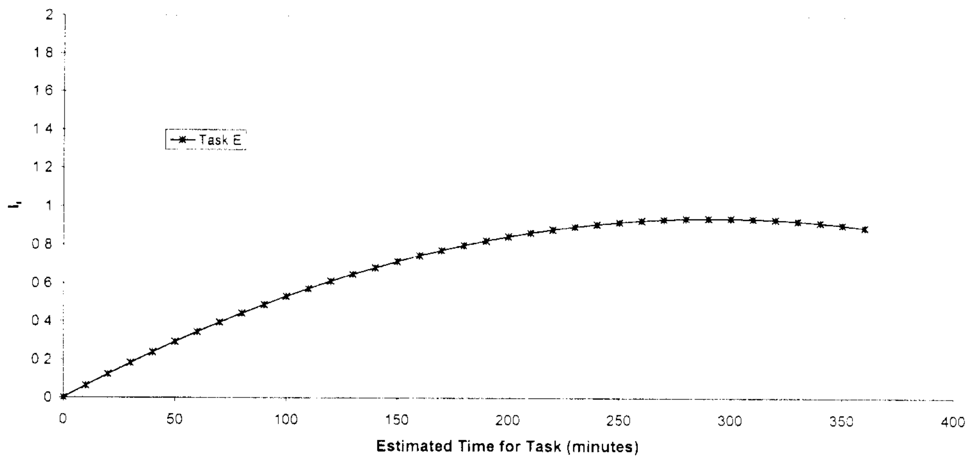
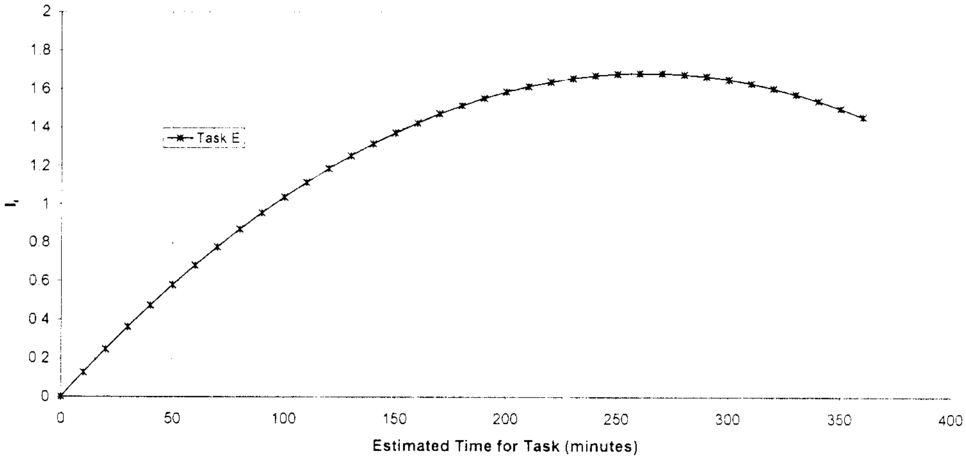


c. Substructure

Figure L33. Influence of combined inspector/inspection factor Reported Structure Complexity Level (1=Very simple, 9=Very complex) on Condition Ratings.



a. Deck



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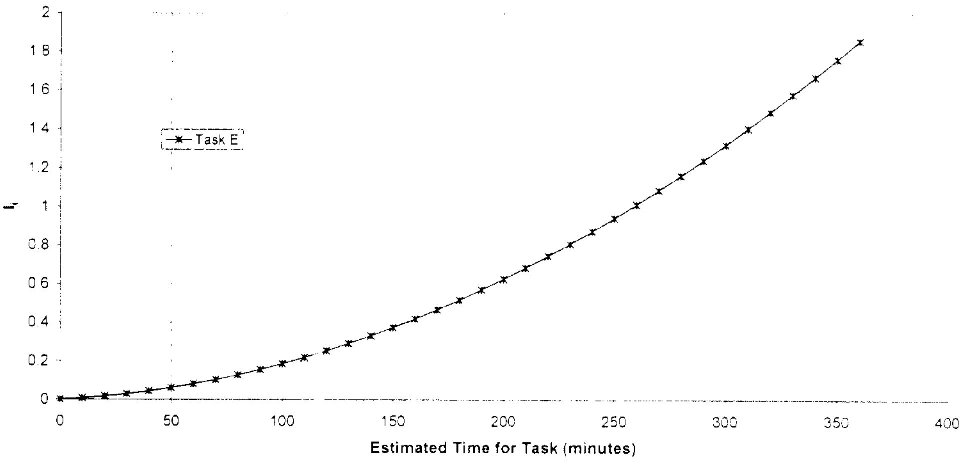
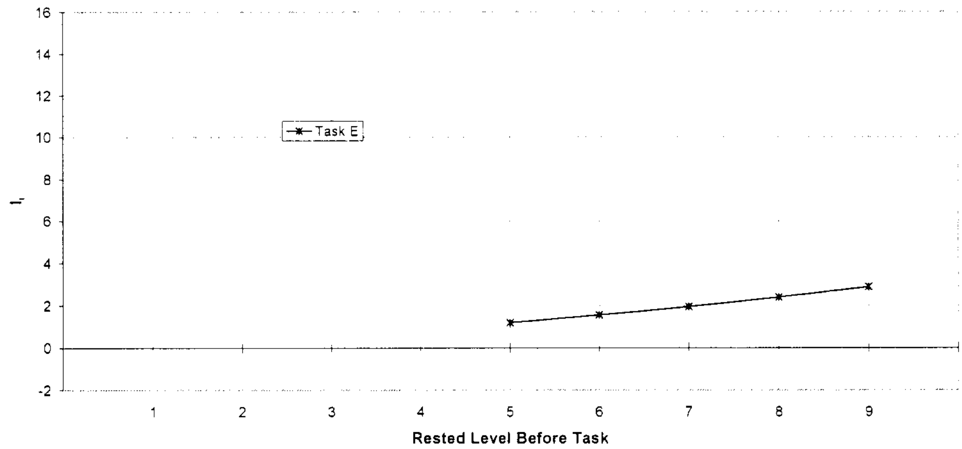


c. Substructure

Figure L34. Influence of combined inspector/inspection factor Estimated Time for Task on Condition Ratings.



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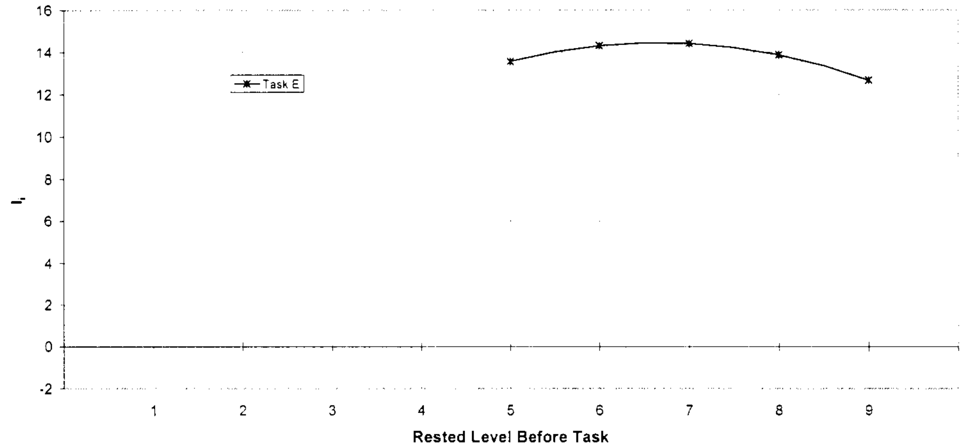

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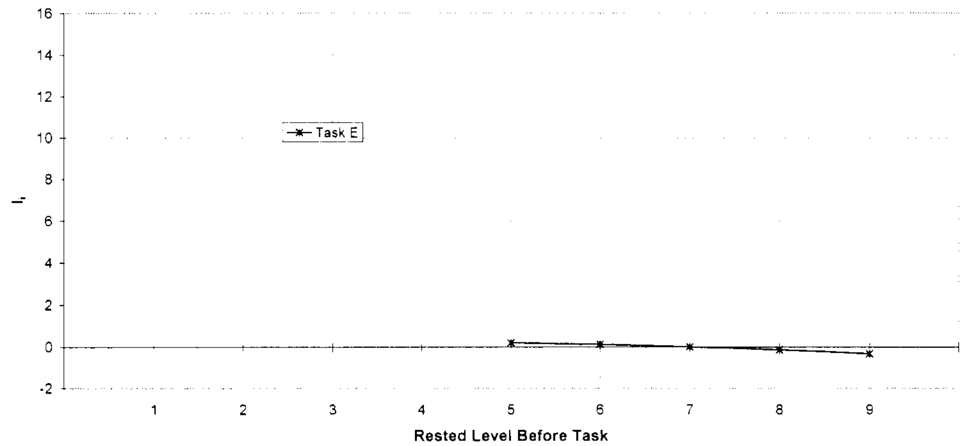
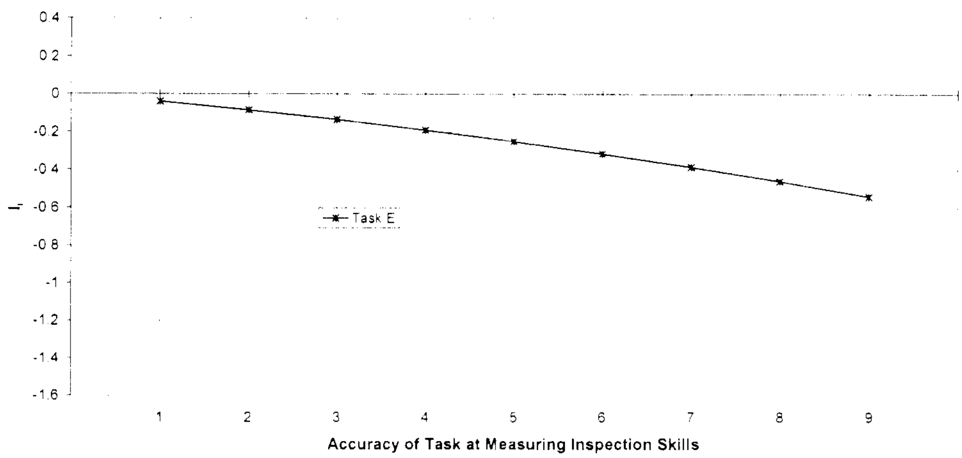
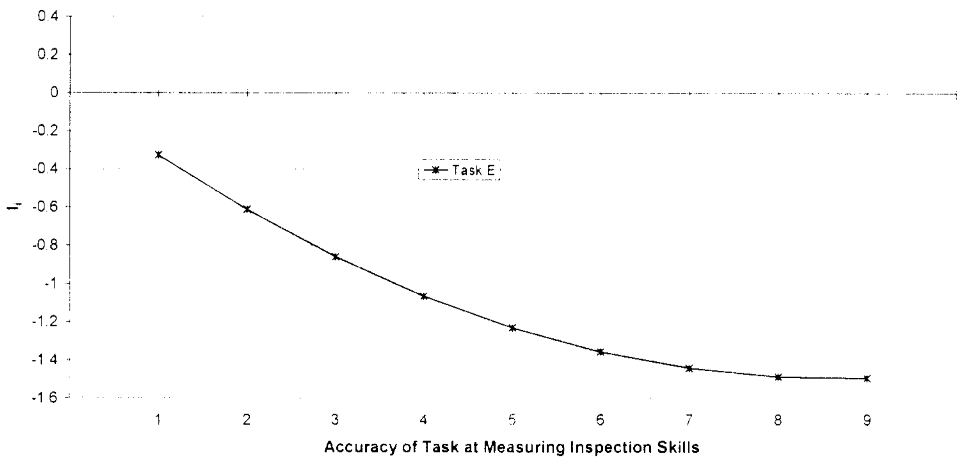


c. Substructure

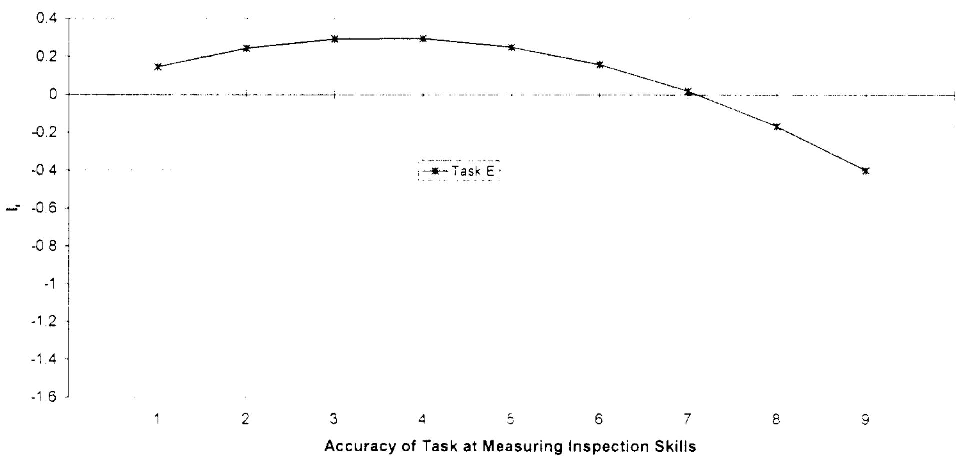
Figure L35. Influence of combined inspector/inspection factor Rested Level Before Task (1=Very tired, 9=Very rested) on Condition Ratings.



a. Deck

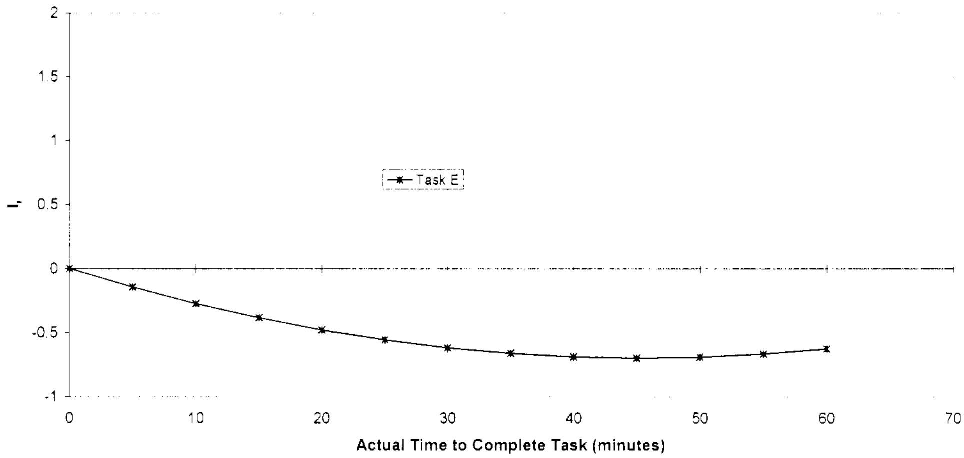


b. Superstructure

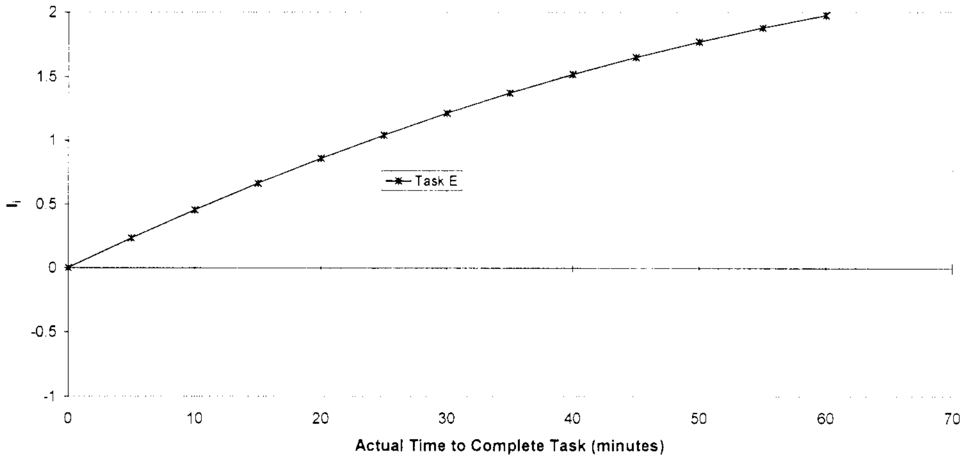


c. Substructure

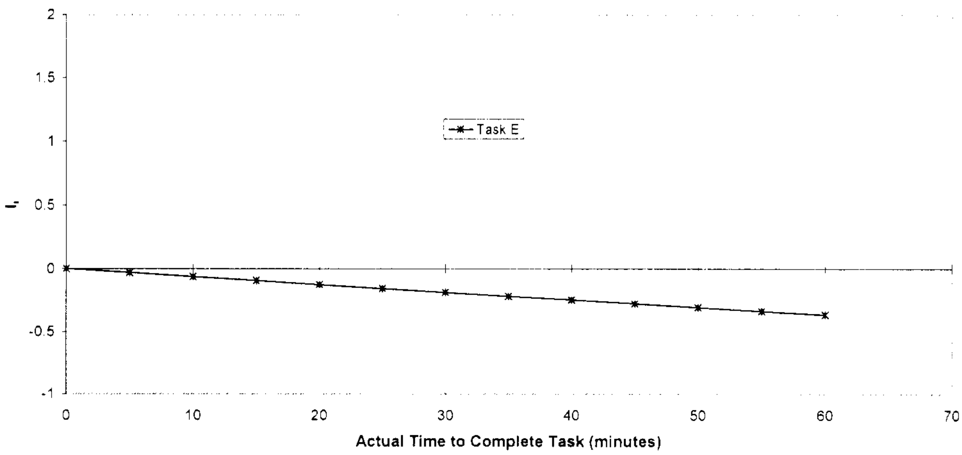
Figure L36. Influence of combined inspector/inspection factor Accuracy of Task at Measuring Inspection Skills (1=Very inaccurate, 9=Very accurate) on Condition Ratings.



a. Deck



b. Superstructure



c. Substructure

Figure L37. Influence of combined inspector/inspection factor Actual Time to Complete Task on Condition Ratings.

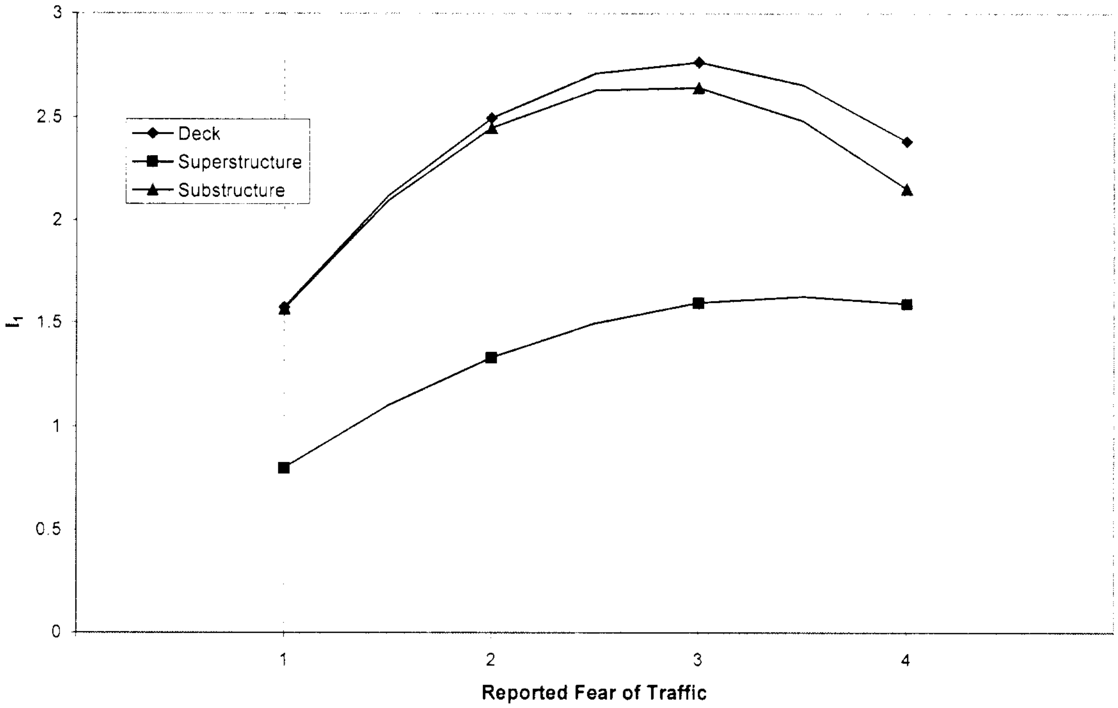


Figure L38. Influence of inspector factor Reported Fear of Traffic (1=Very fearful, 4=No fear) on DFR.

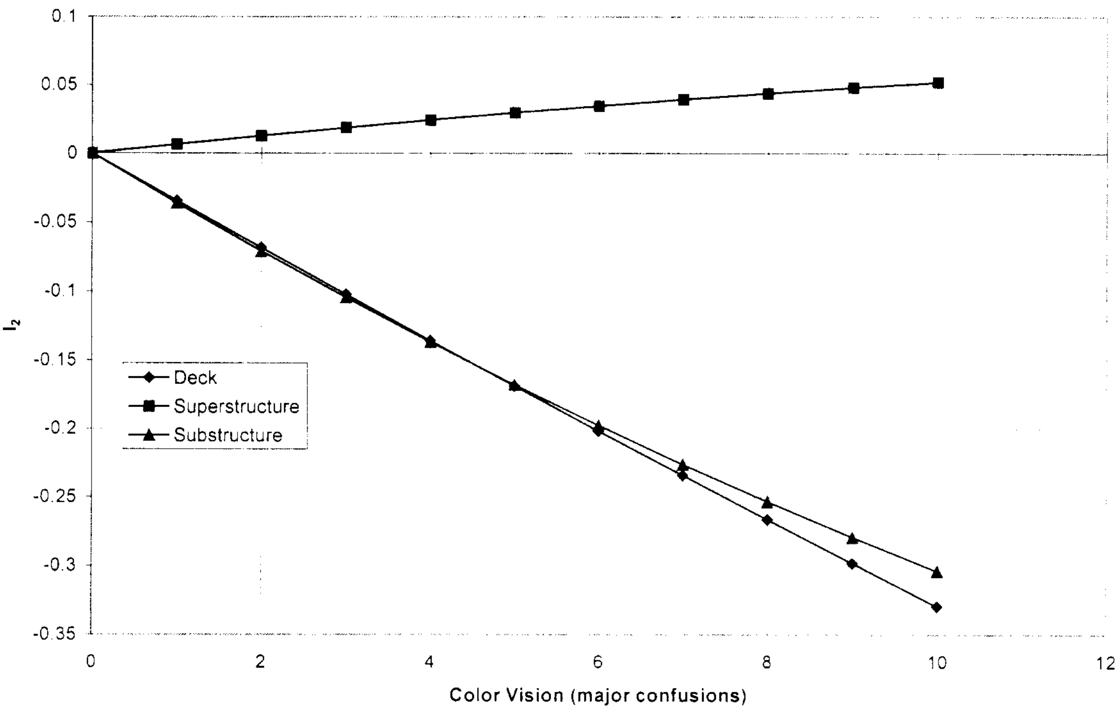


Figure L39. Influence of inspector factor Color Vision (number of major confusions) on DFR.

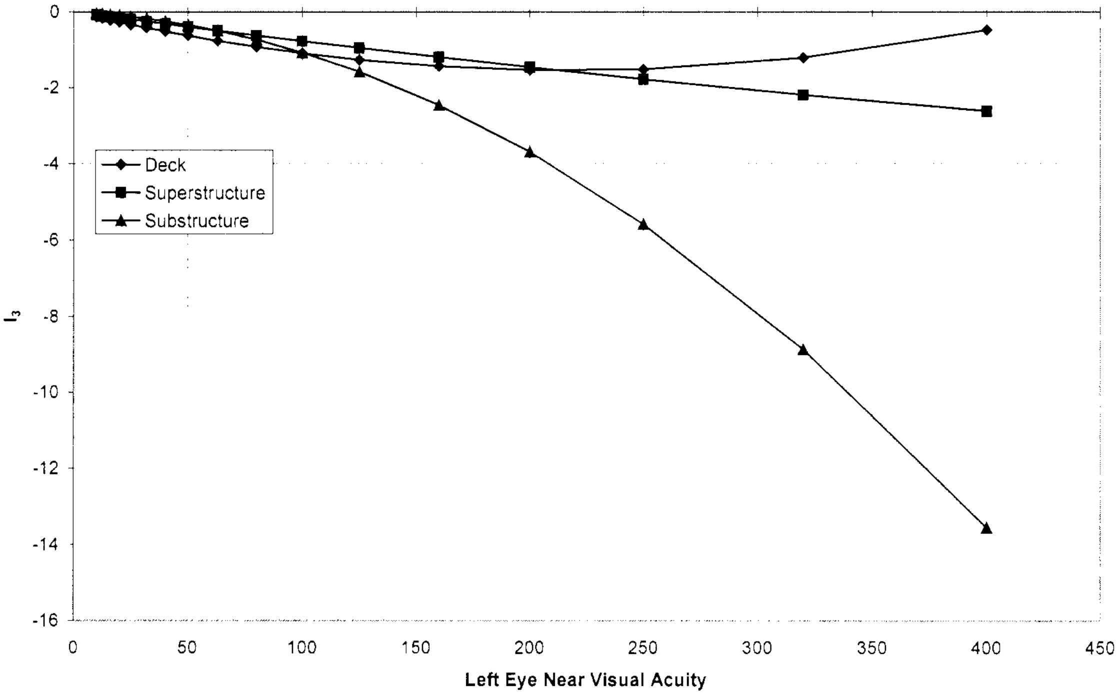


Figure L40. Influence of inspector factor Left Eye Near Visual Acuity on DFR.

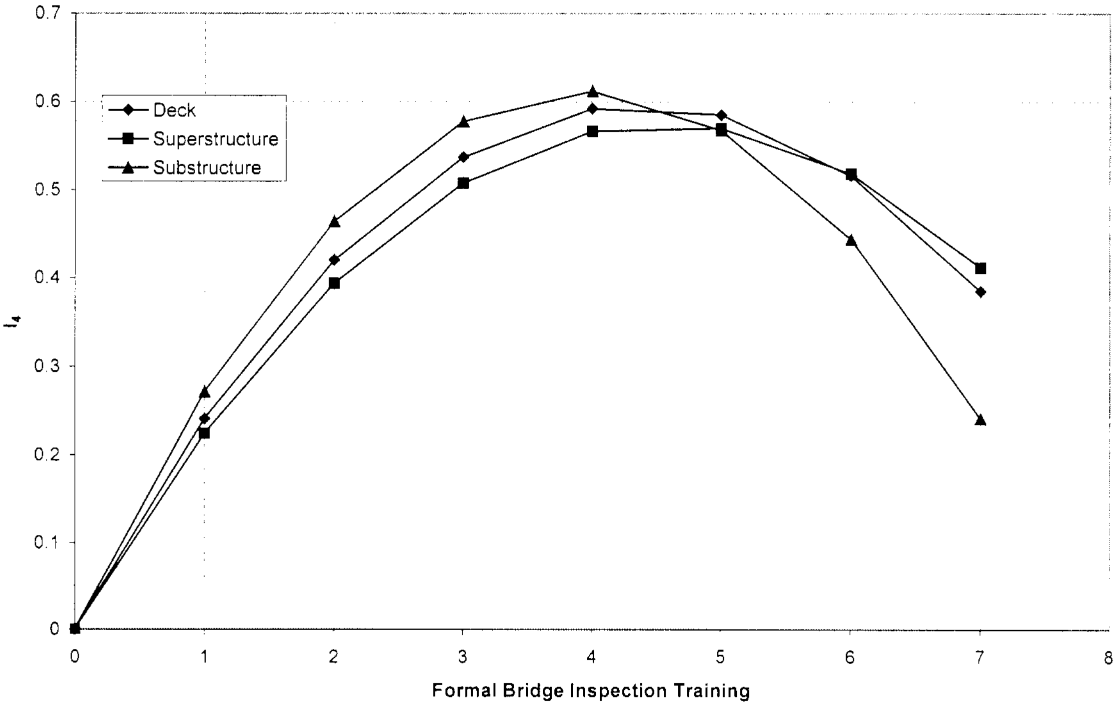


Figure L41. Influence of inspector factor Formal Bridge Inspection Training (number of FHWA training courses) on DFR.

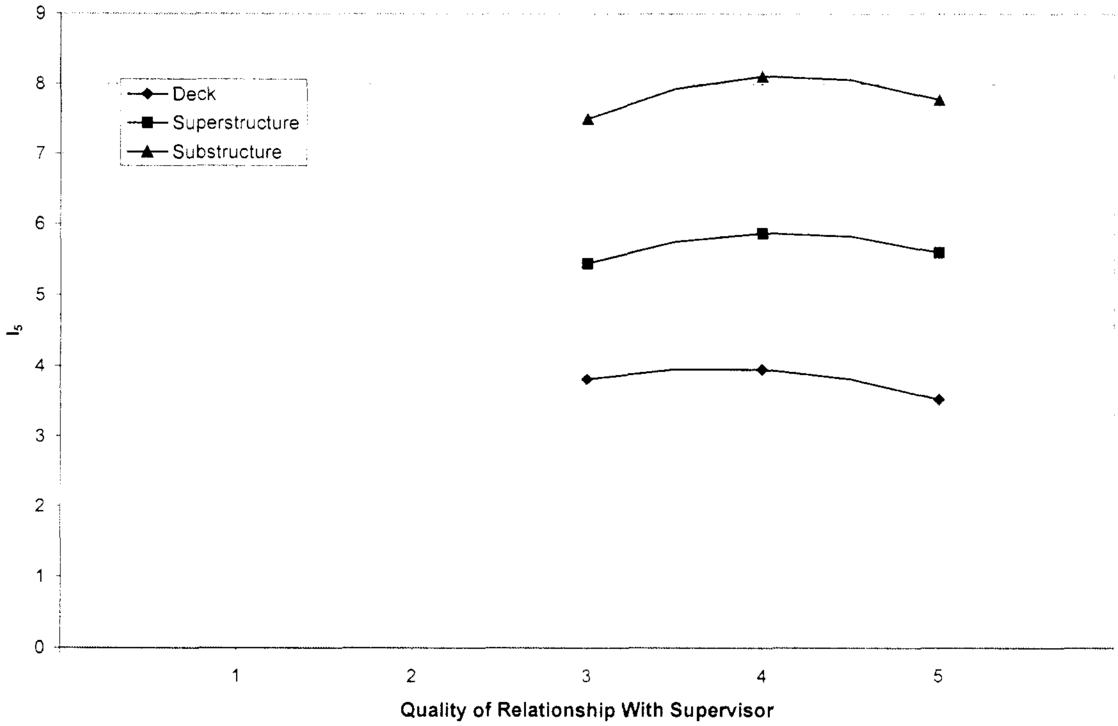


Figure L42. Influence of inspector factor Quality of Relationship With Supervisor (1=Very poor, 5=Very good) on DFR.

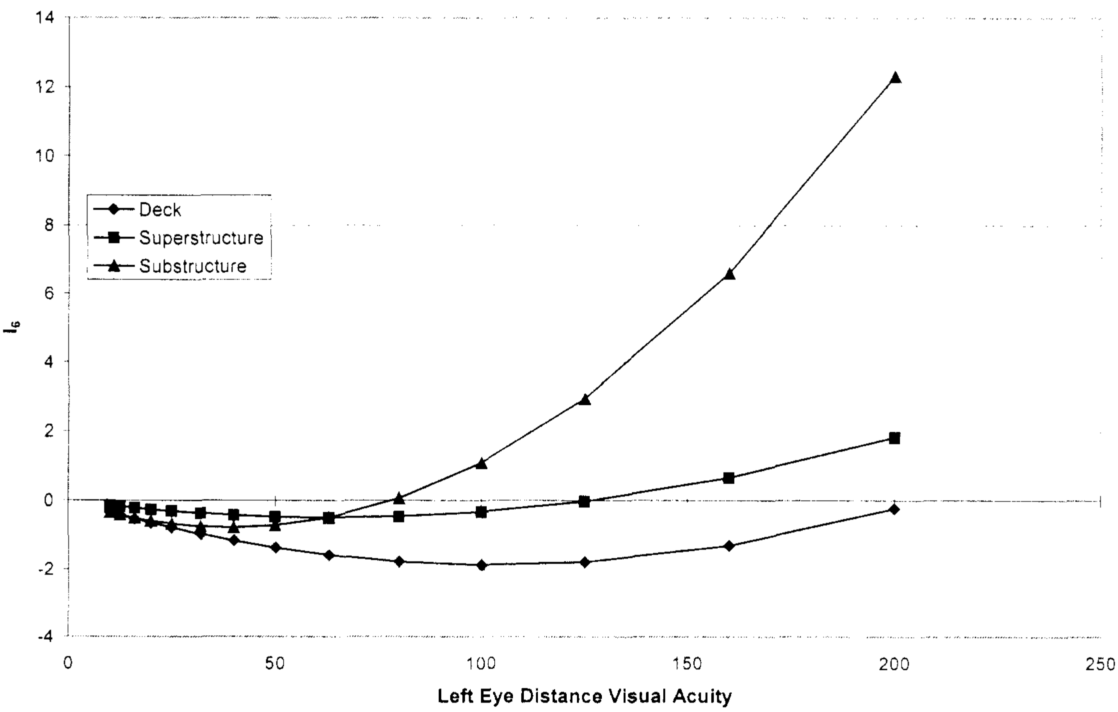


Figure L43. Influence of inspector factor Left Eye Distance Visual Acuity on DFR.

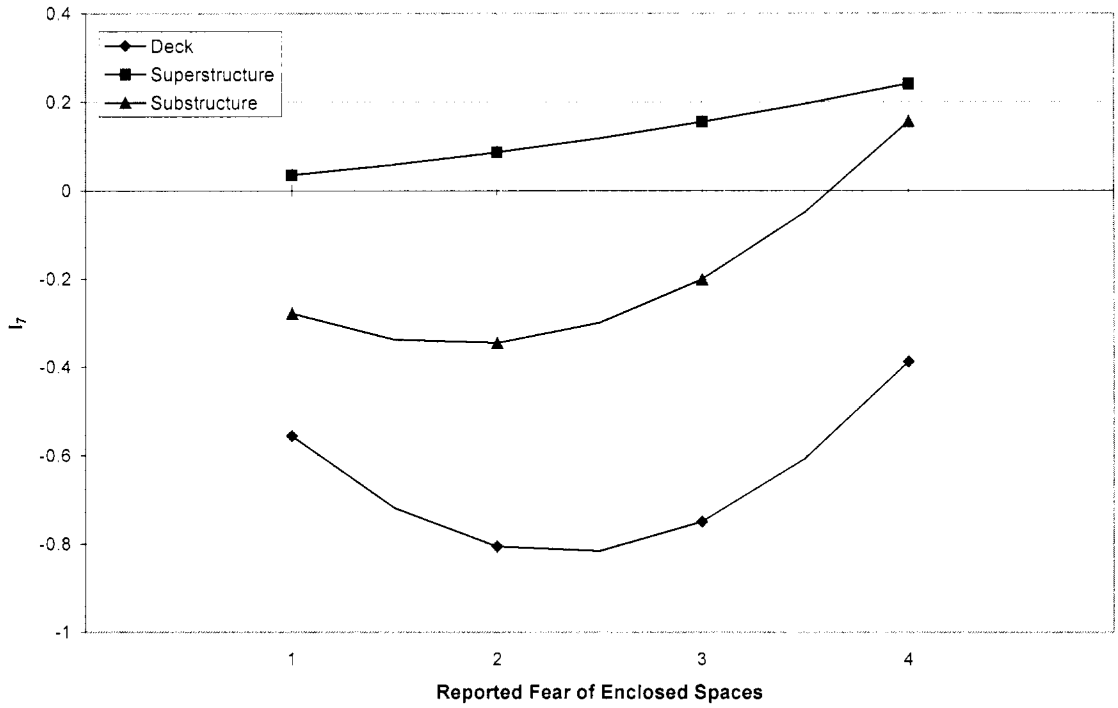


Figure L44. Influence of inspector factor Reported Fear of Enclosed Spaces (1=Very fearful, 4=No fear) on DFR.

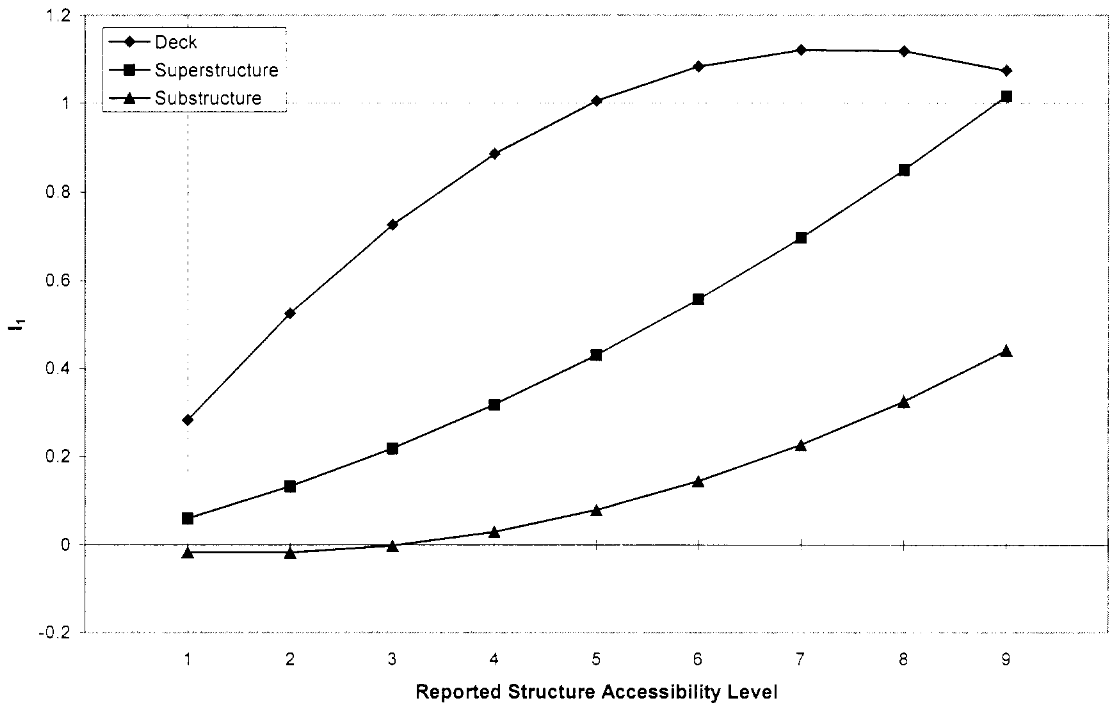


Figure L45. Influence of inspection factor Reported Structure Accessibility Level (1=Very inaccessible, 9=Very accessible) on DFR.

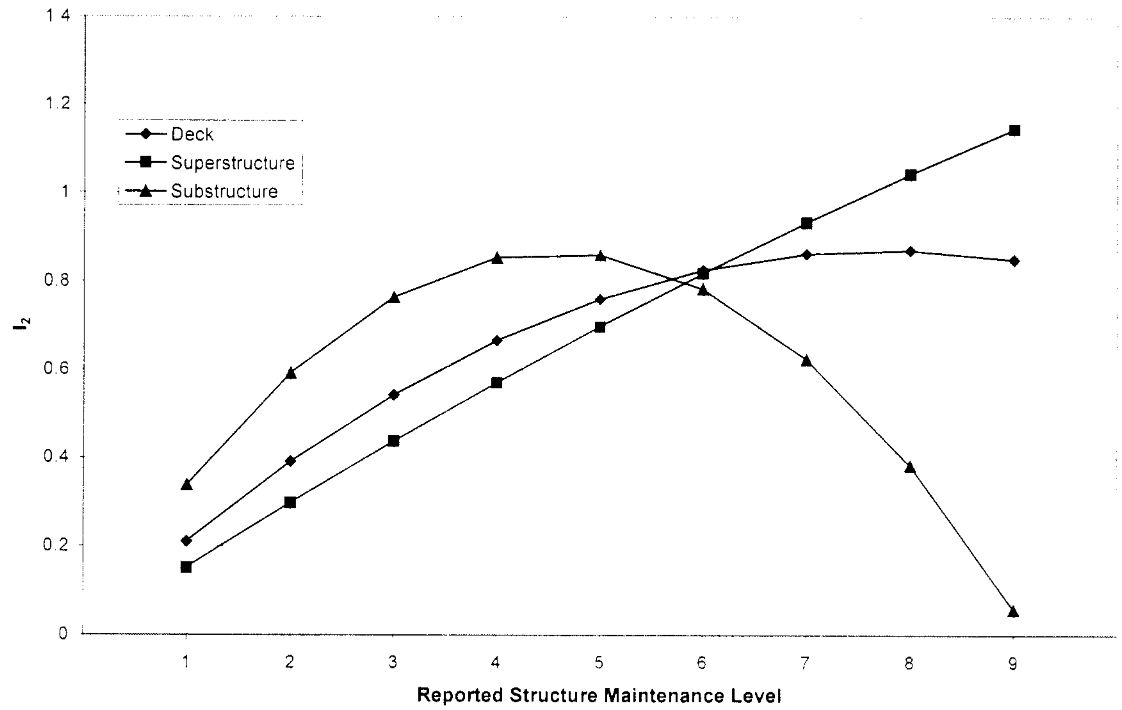


Figure L46. Influence of inspection factor Reported Structure Maintenance Level (1=Very poorly, 9=Very well) on DFR.

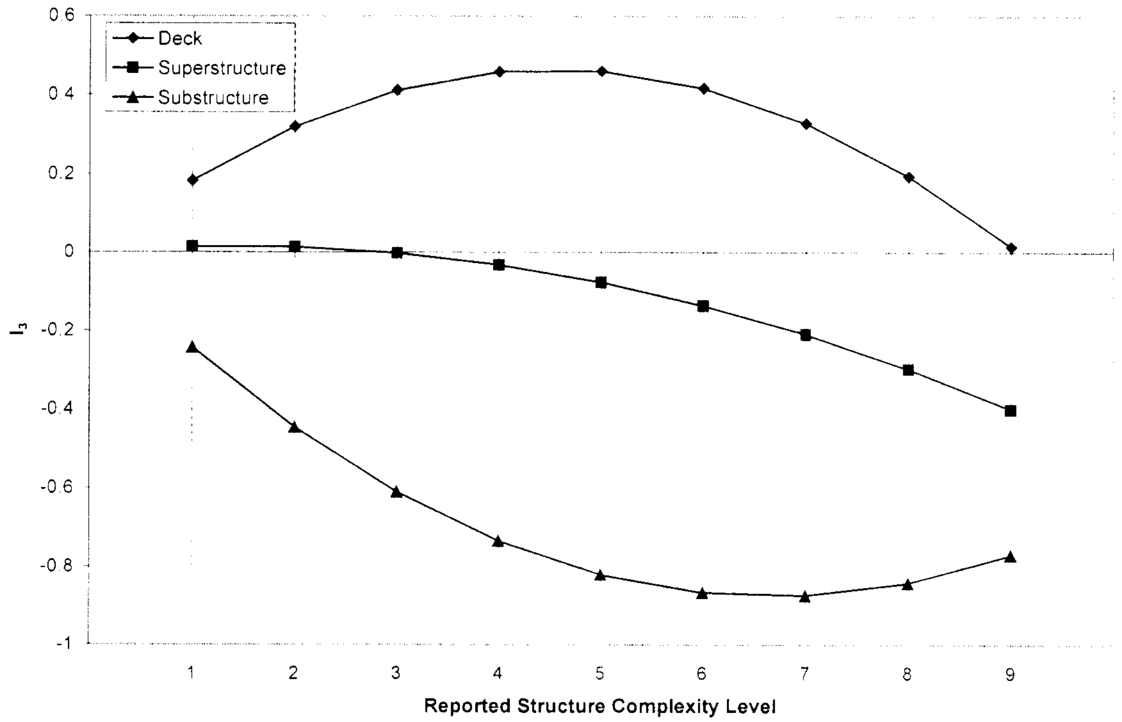


Figure L47. Influence of inspection factor Reported Structure Complexity Level (1=Very simple, 9=Very complex) on DFR.

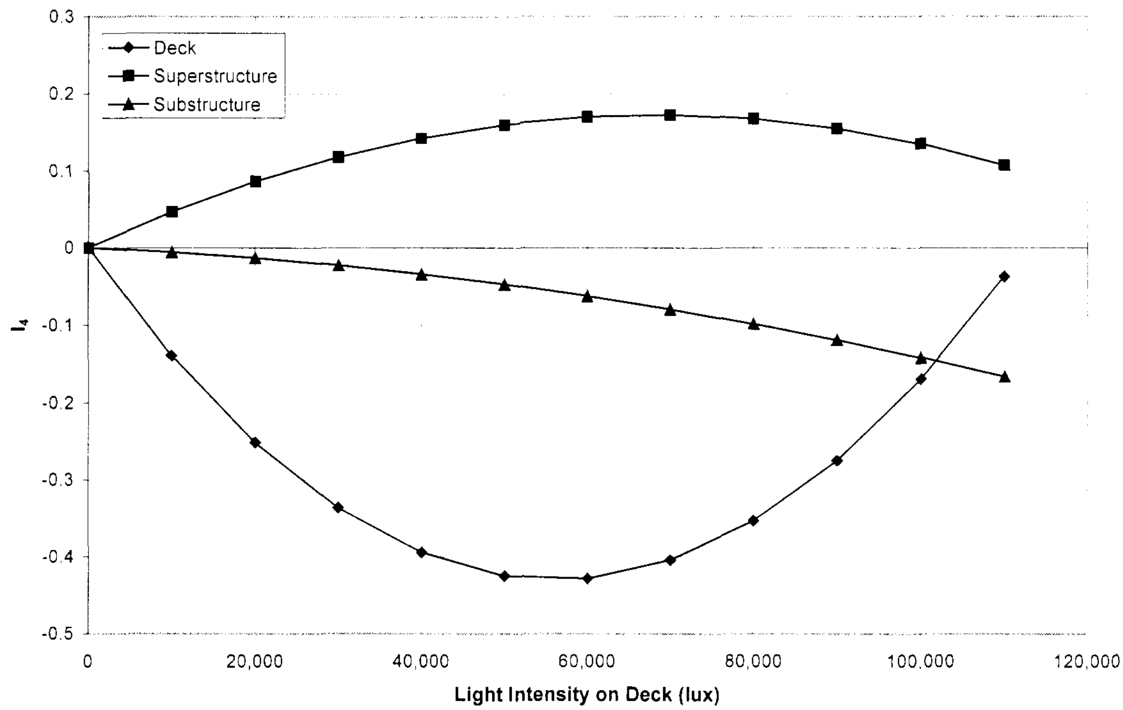


Figure L48. Influence of inspection factor Light Intensity on Deck on DFR.

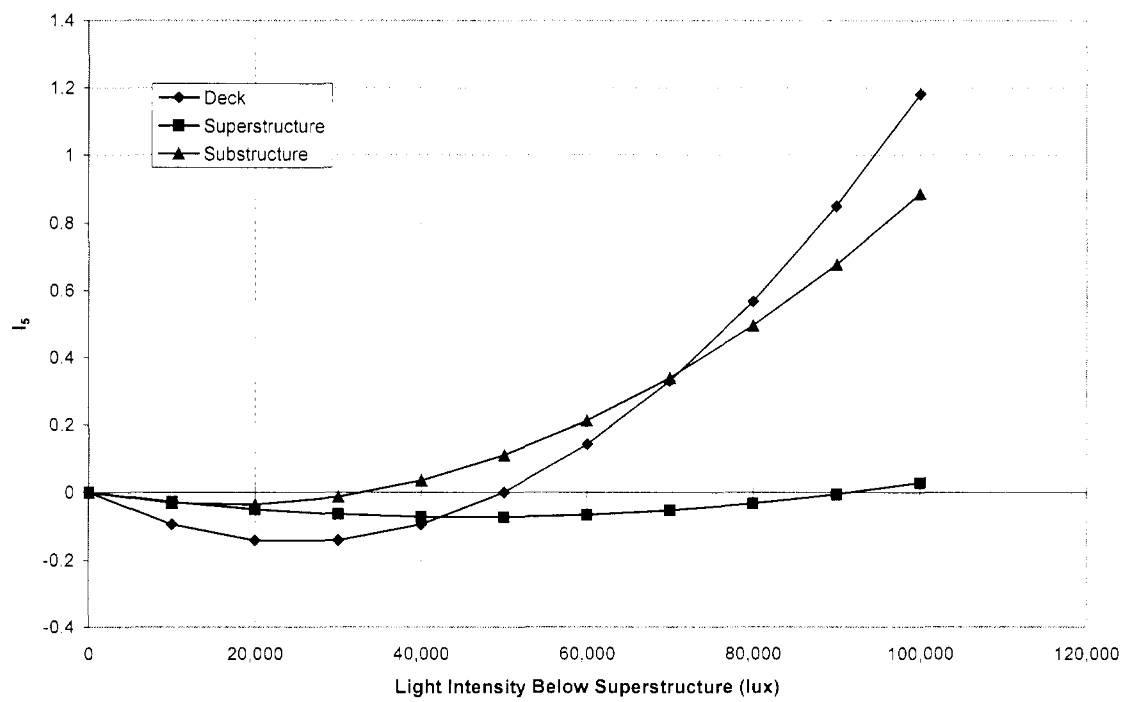


Figure L49. Influence of inspection factor Light Intensity Below Superstructure on DFR.

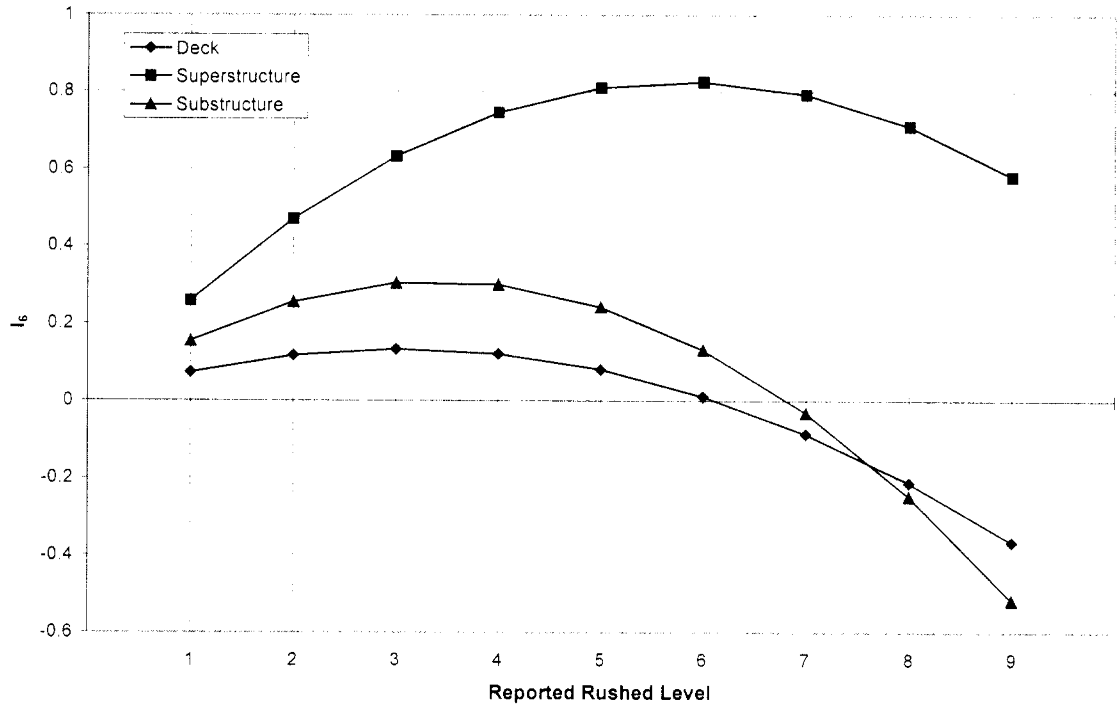


Figure L50. Influence of inspection factor Reported Rushed Level (1=Not rushed, 9=Very rushed) on DFR.

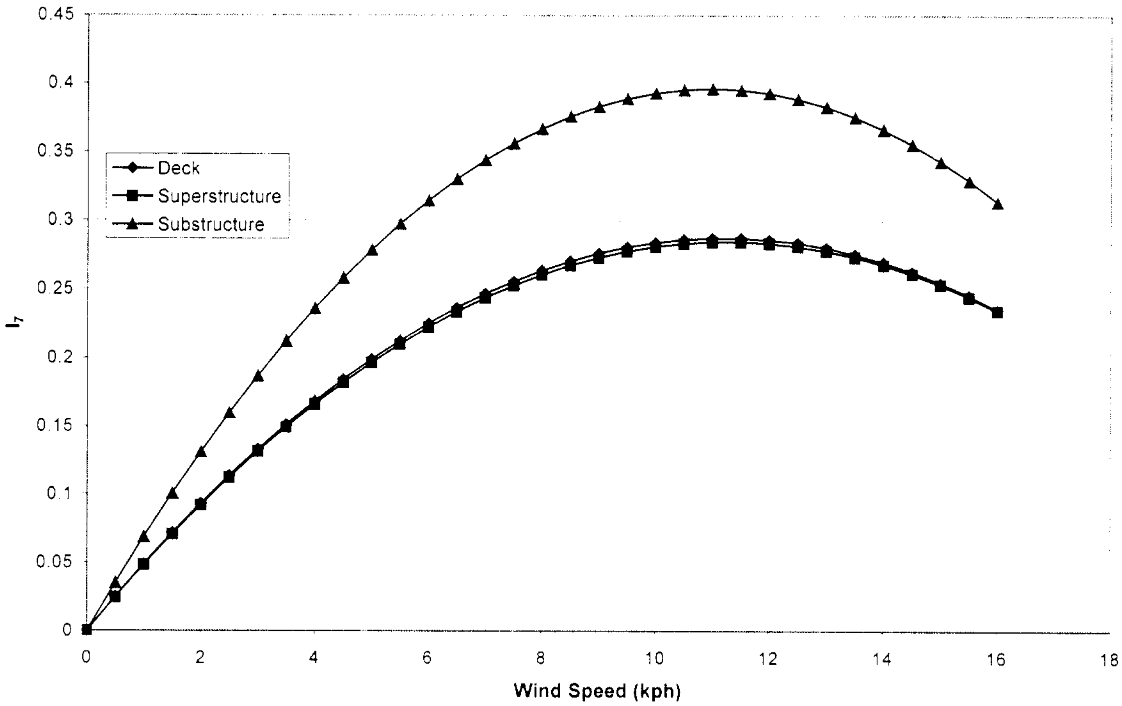


Figure L51. Influence of inspection factor Wind Speed on DFR.

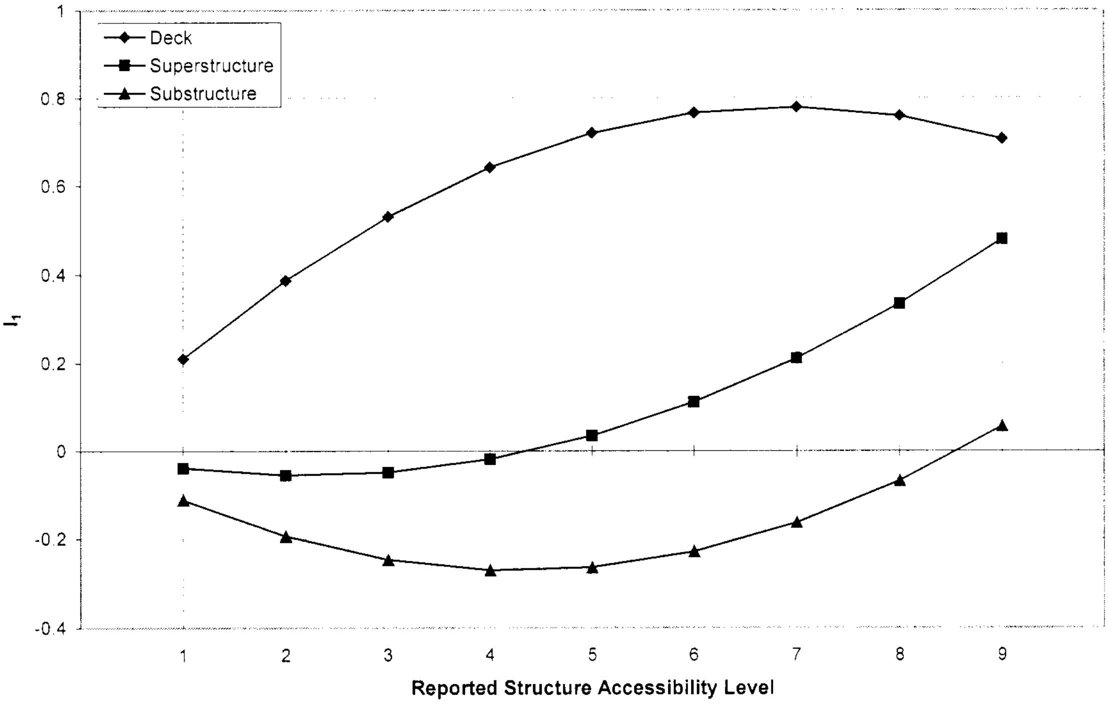


Figure L52. Influence of combined inspector/inspection factor Reported Structure Accessibility Level (1=Very inaccessible, 9=Very accessible) on DFR.

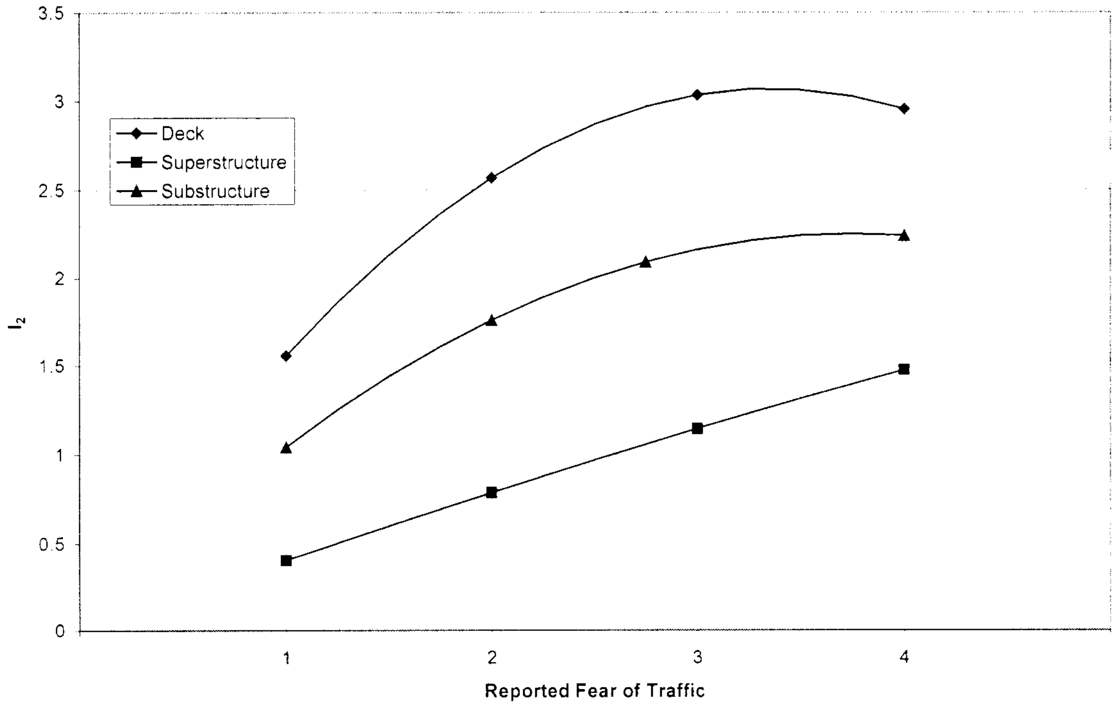


Figure L53. Influence of combined inspector/inspection factor Reported Fear of Traffic (1=Very fearful, 4=No fear) on DFR.

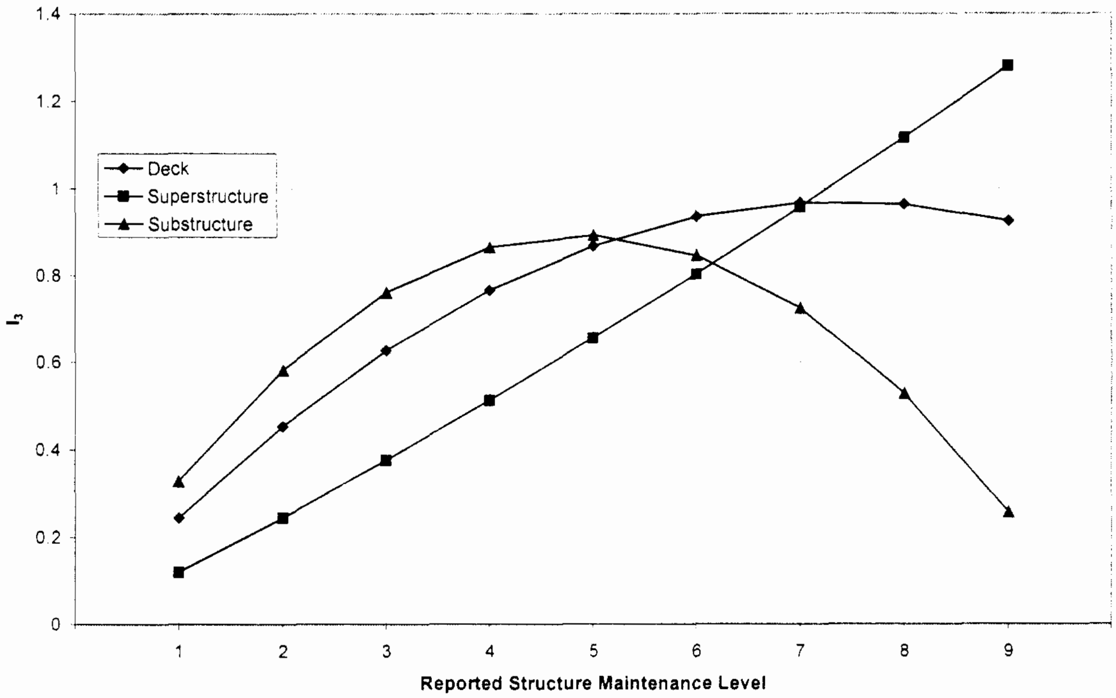


Figure L54. Influence of combined inspector/inspection factor Reported Structure Maintenance Level (1=Very poorly, 9=Very well) on DFR.

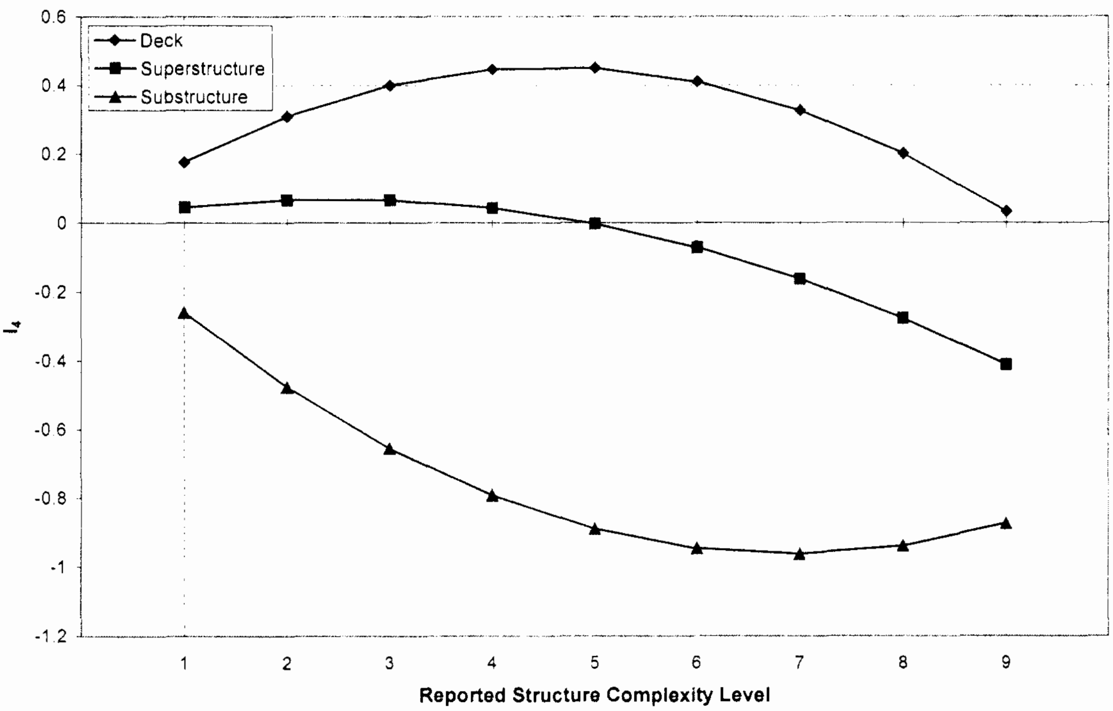


Figure L55. Influence of combined inspector/inspection factor Reported Structure Complexity Level (1=Very simple, 9=Very complex) on DFR.

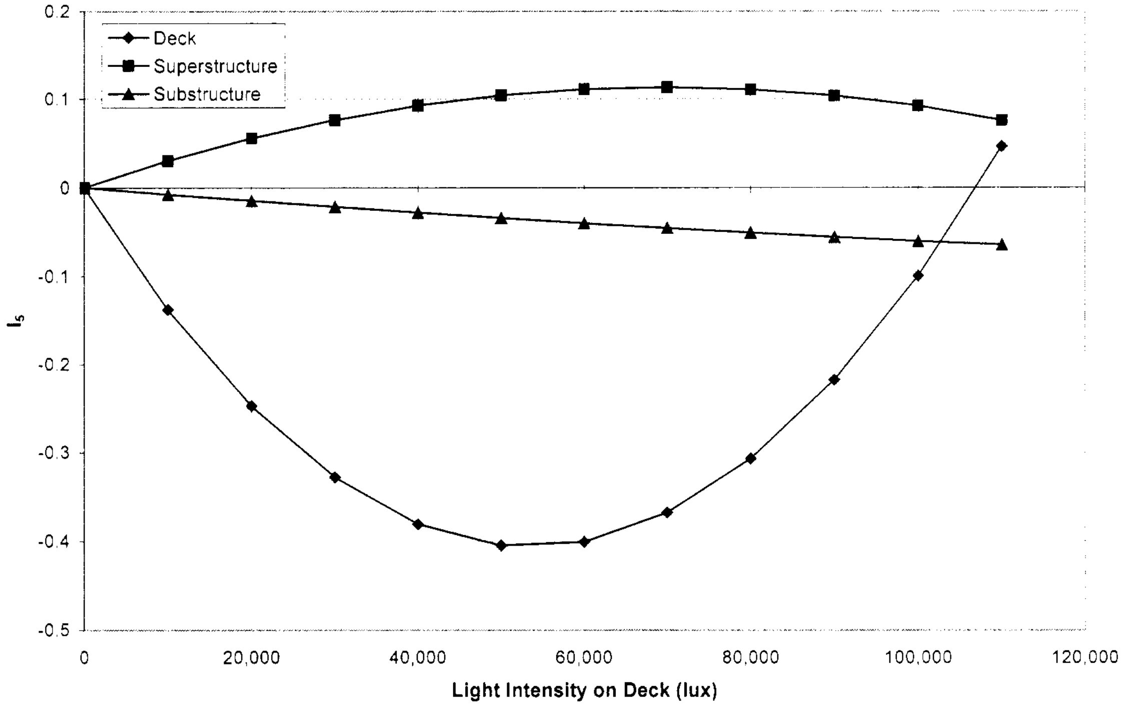


Figure L56. Influence of combined inspector/inspection factor Light Intensity on Deck on DFR.

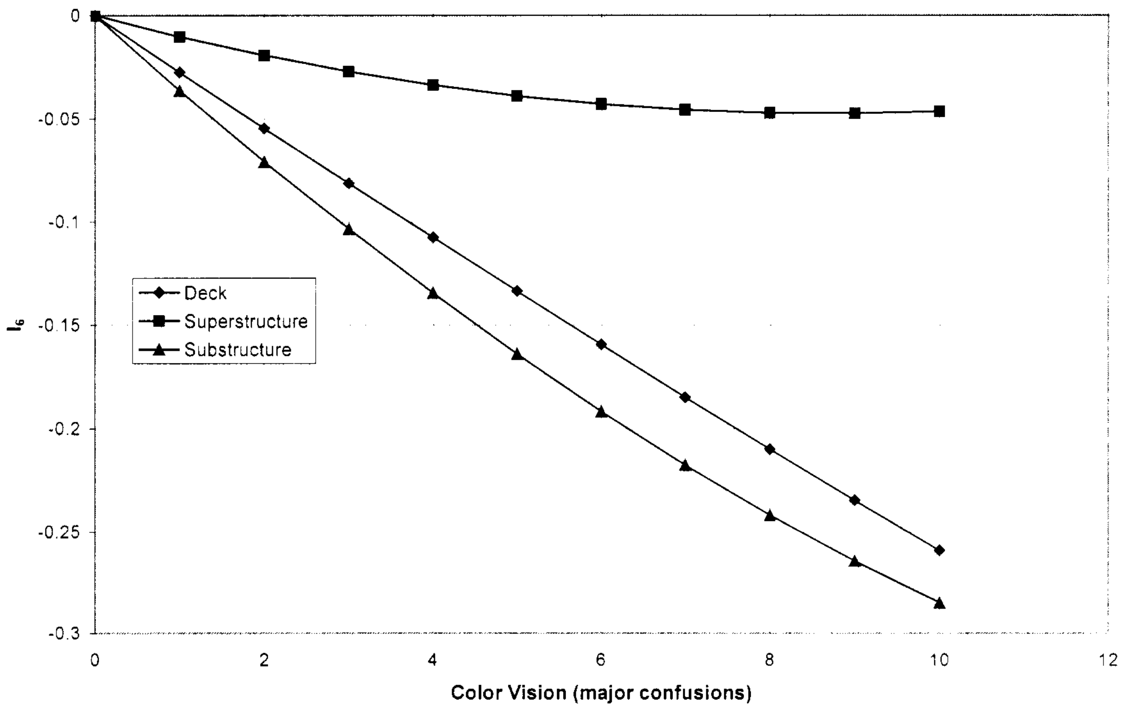


Figure L57. Influence of combined inspector/inspection factor Color Vision (number of major confusions) on DFR.

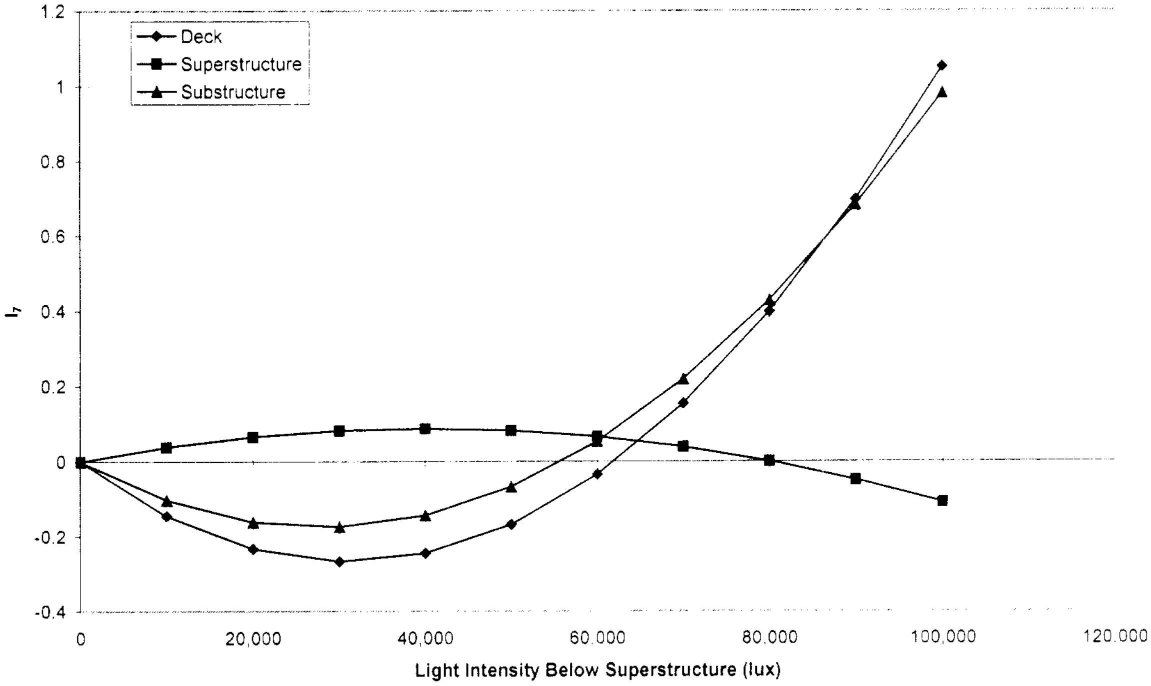


Figure L58. Influence of combined inspector/inspection factor Light Intensity Below Superstructure on DFR.

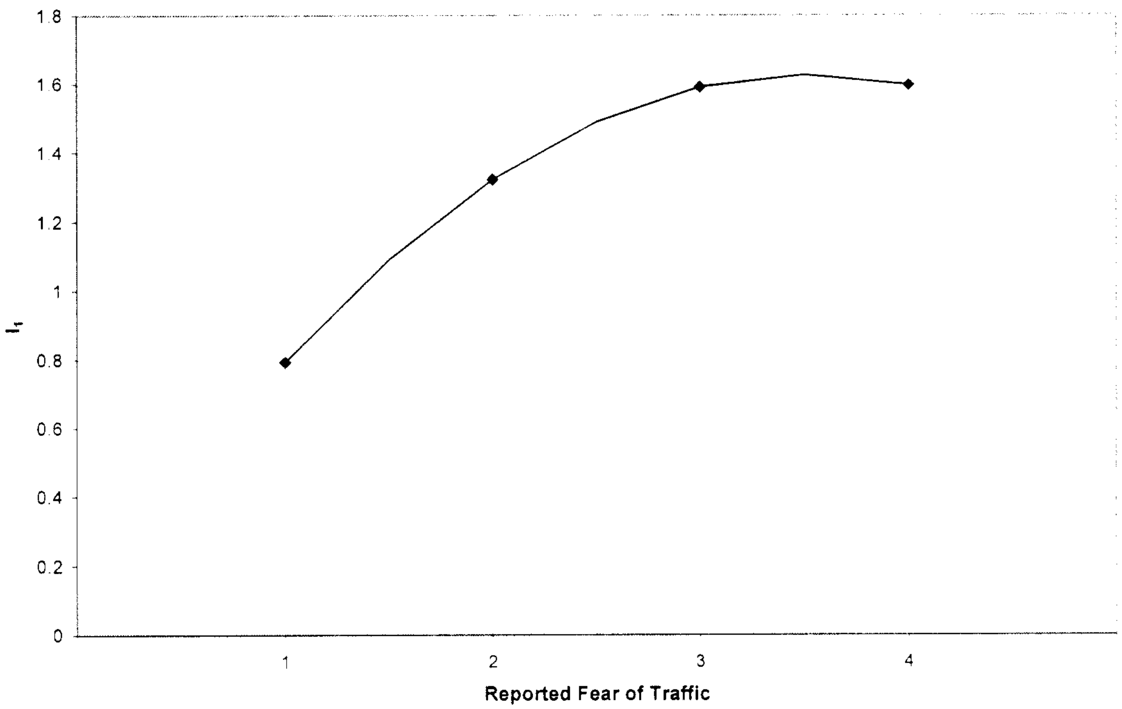


Figure L59. Influence of inspector factor Reported Fear of Traffic (1=Very fearful, 4=No fear) on general DFR.

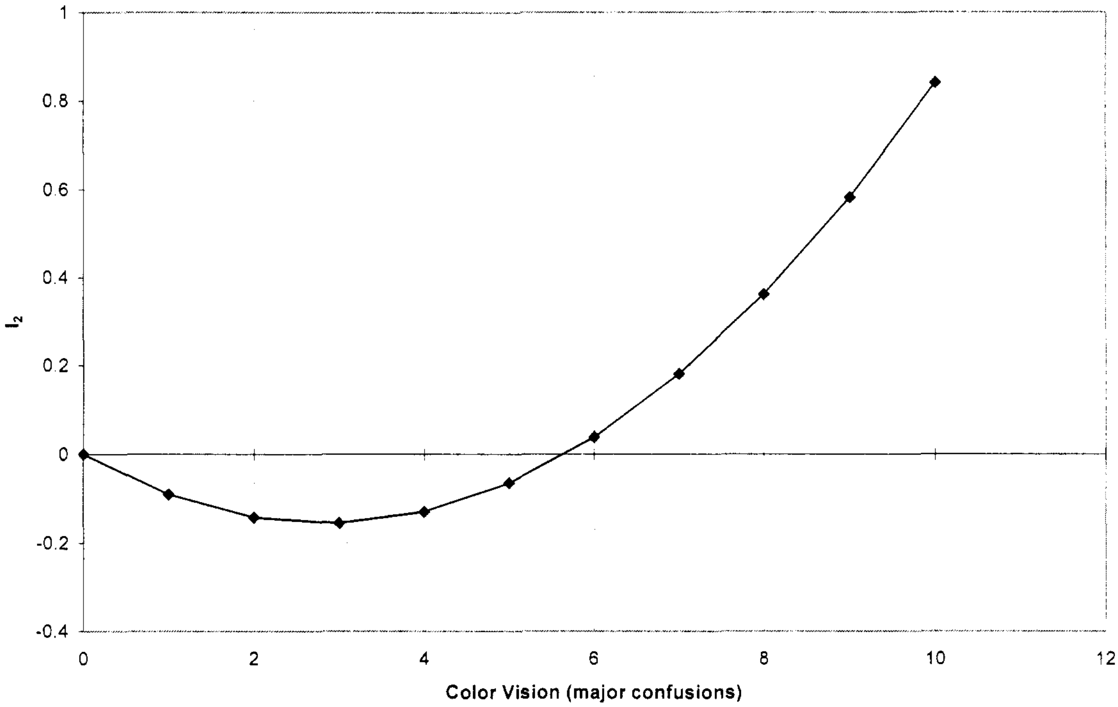


Figure L60. Influence of inspector factor Color Vision (number of major confusions) on general DFR.

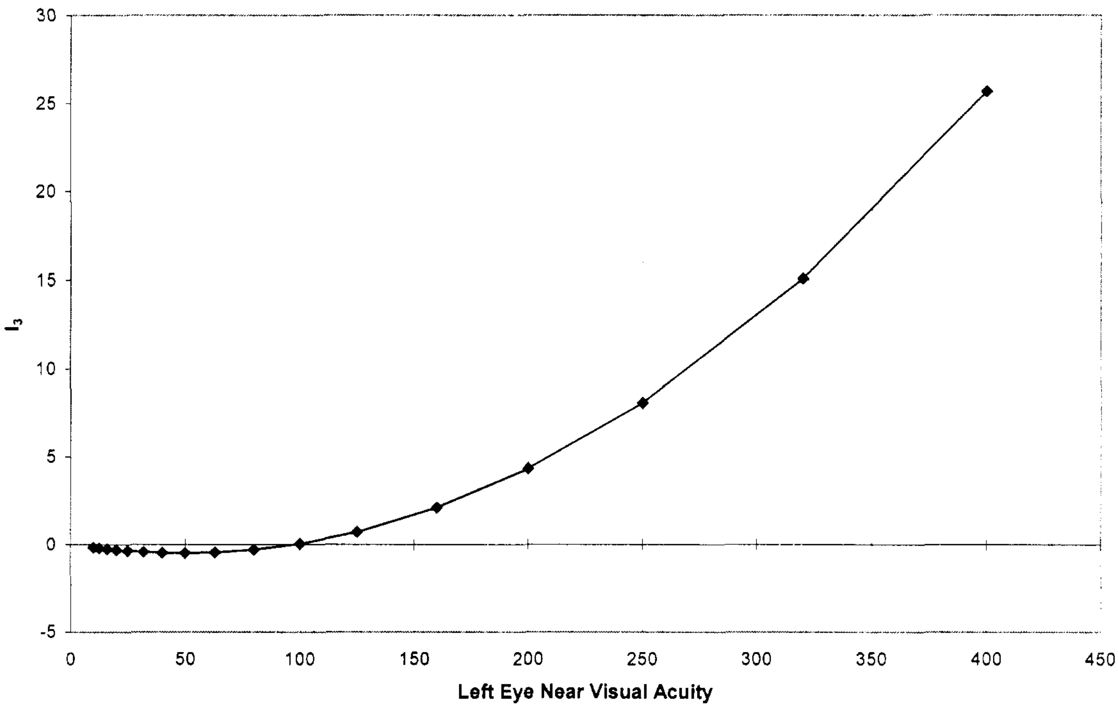


Figure L61. Influence of inspector factor Left Eye Near Visual Acuity on general DFR.

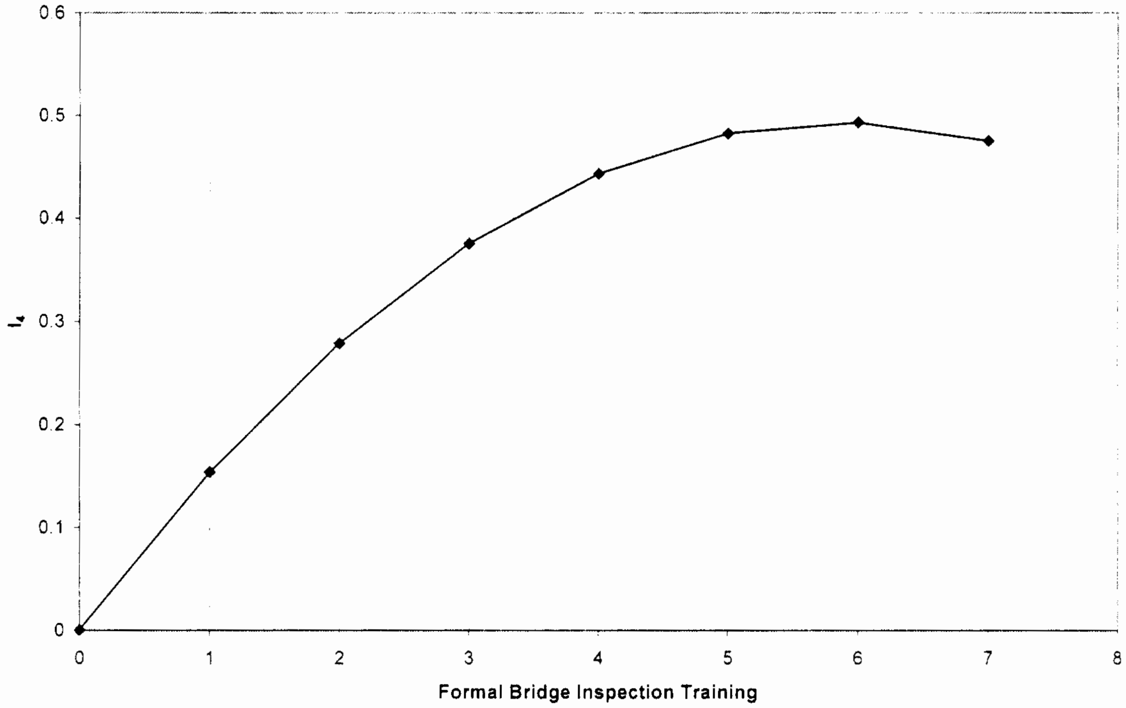


Figure L62. Influence of inspector factor Formal Bridge Inspection Training (number of FHWA training courses) on general DFR.

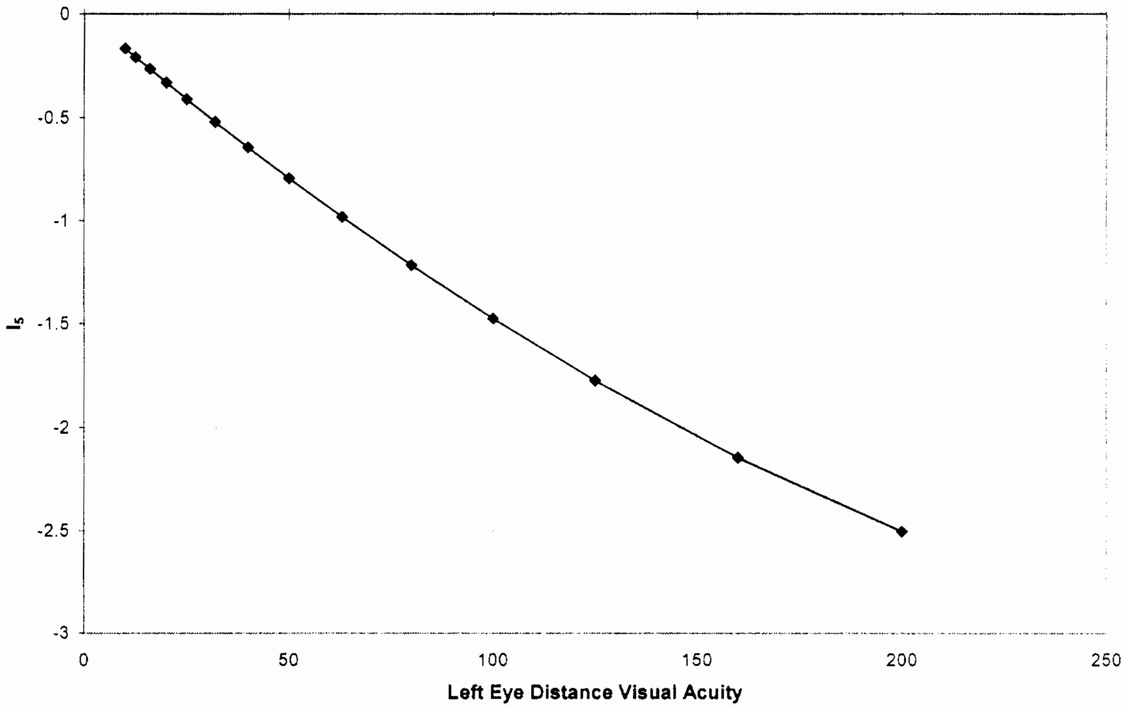


Figure L63. Influence of inspector factor Left Eye Distance Visual Acuity on general DFR.

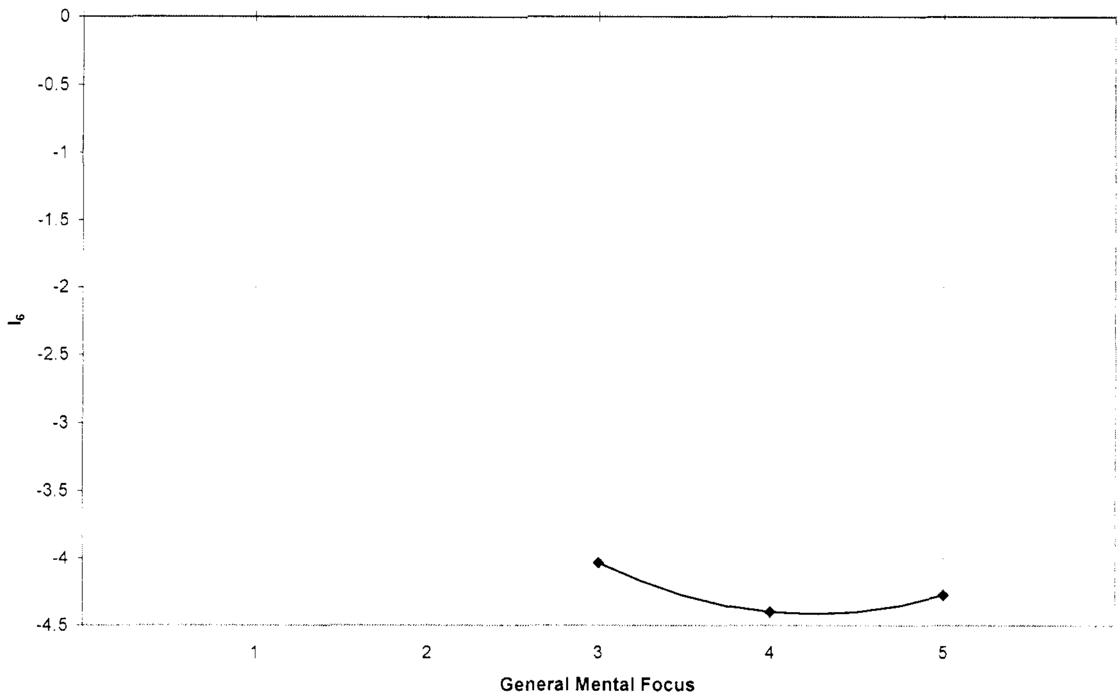


Figure L64. Influence of inspector factor General Mental Focus (1=Poor, 5=Very focused) on general DFR.

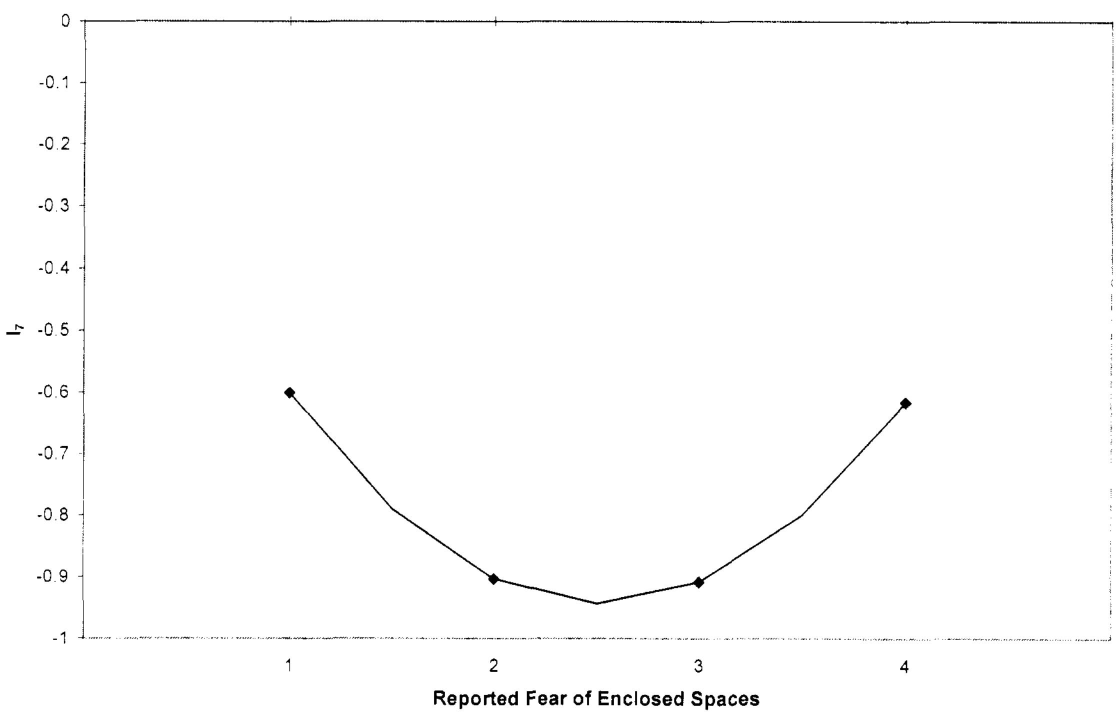


Figure L65. Influence of inspector factor Reported Fear of Enclosed Spaces (1=Very fearful, 4=No fear) on general DFR.

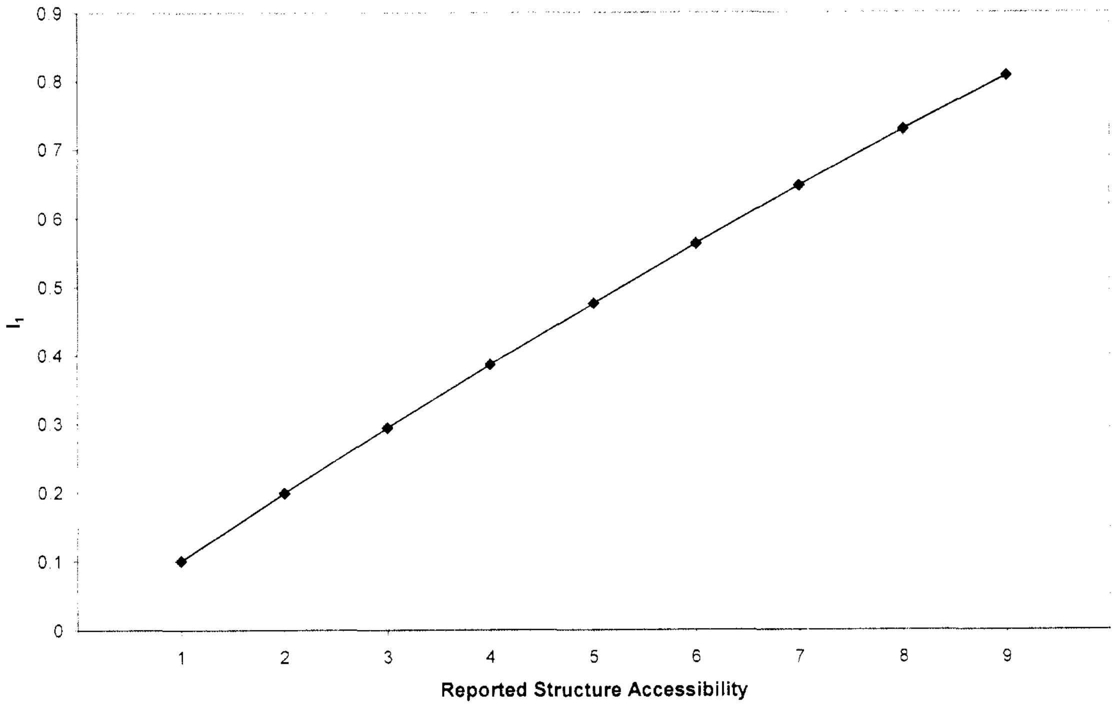


Figure L66. Influence of inspection factor Reported Structure Accessibility (1=Very inaccessible, 9=Very accessible) on general DFR.

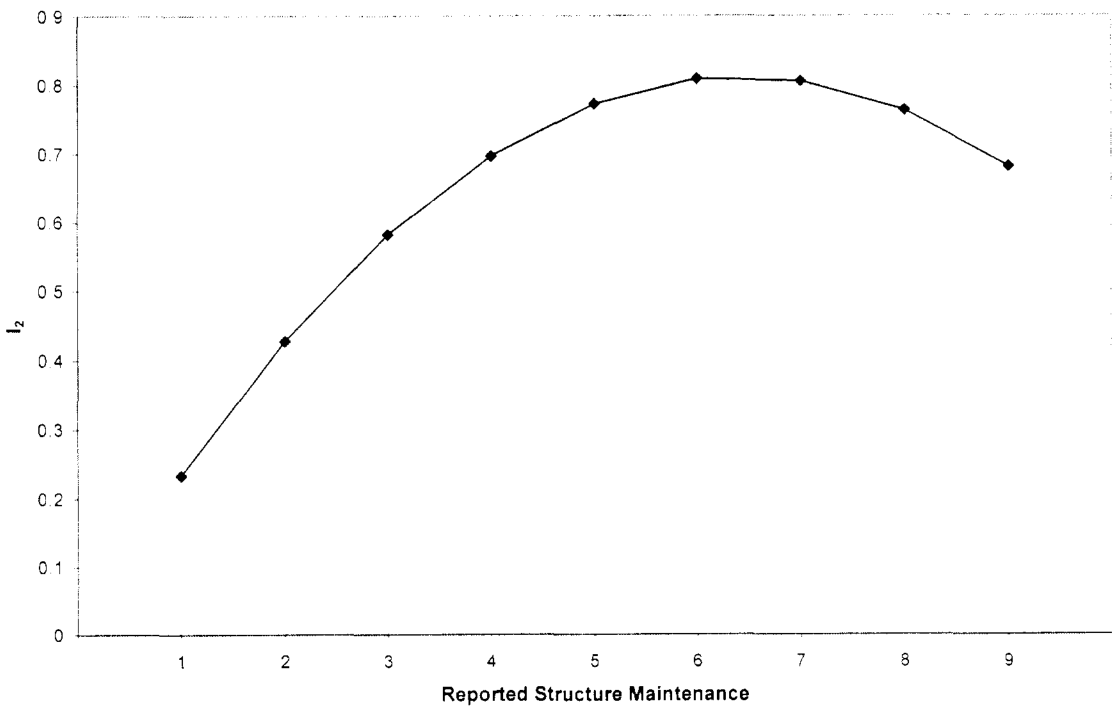


Figure L67. Influence of inspection factor Reported Structure Maintenance (1=Very poorly, 9=Very well) on general DFR.

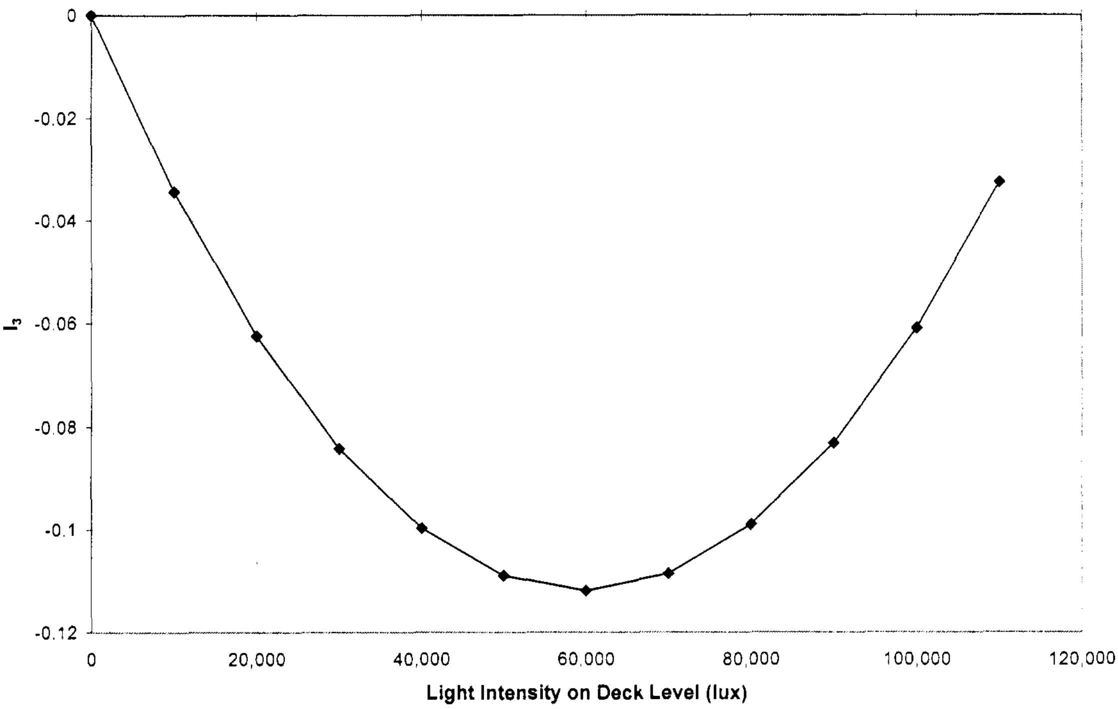


Figure L68. Influence of inspection factor Light Intensity on Deck Level on general DFR.

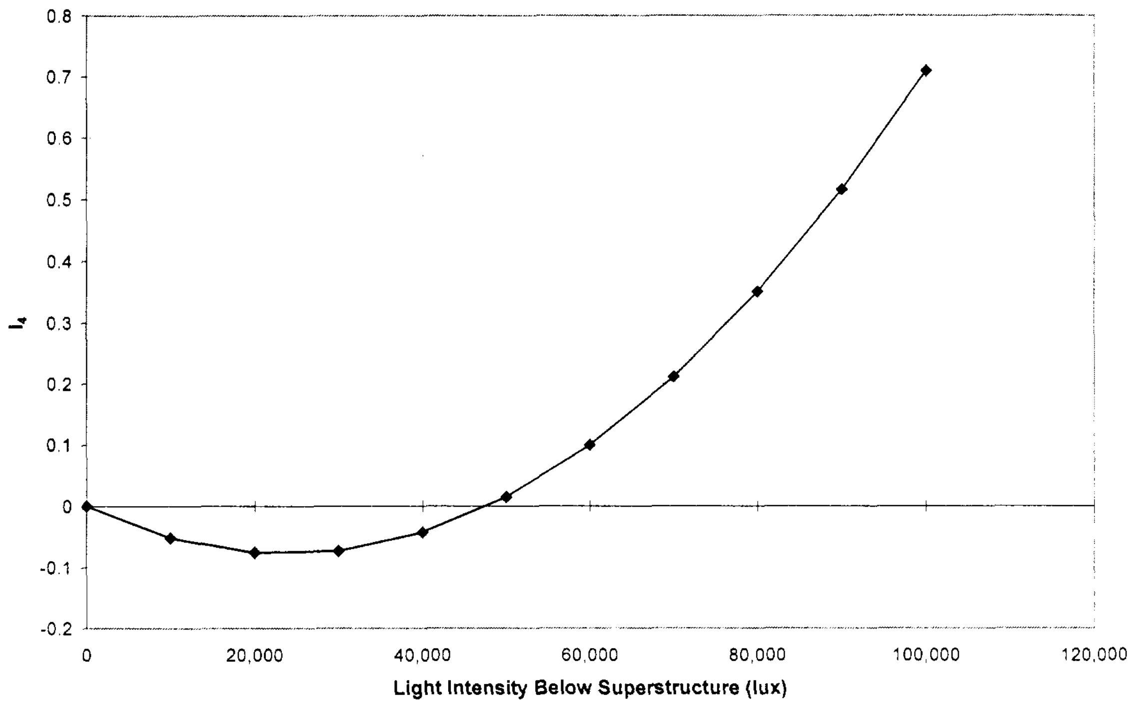


Figure L69. Influence of inspection factor Light Intensity Below Superstructure on general DFR.

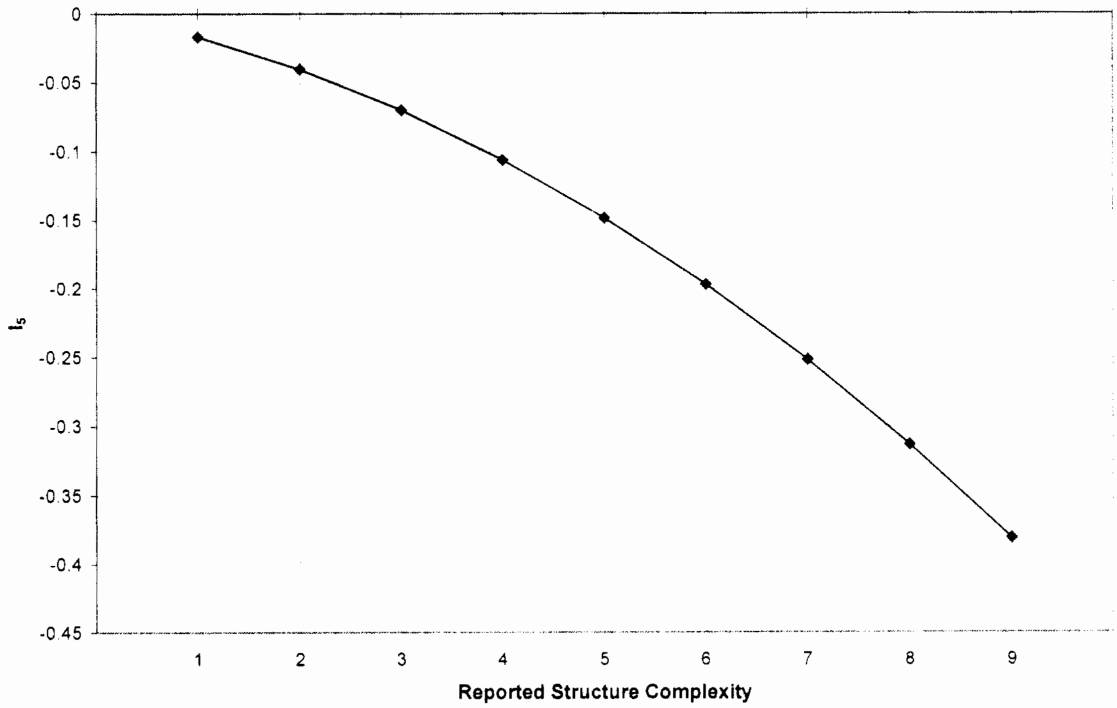


Figure L70. Influence of inspection factor Reported Structure Complexity (1=Very simple, 9=Very complex) on general DFR.

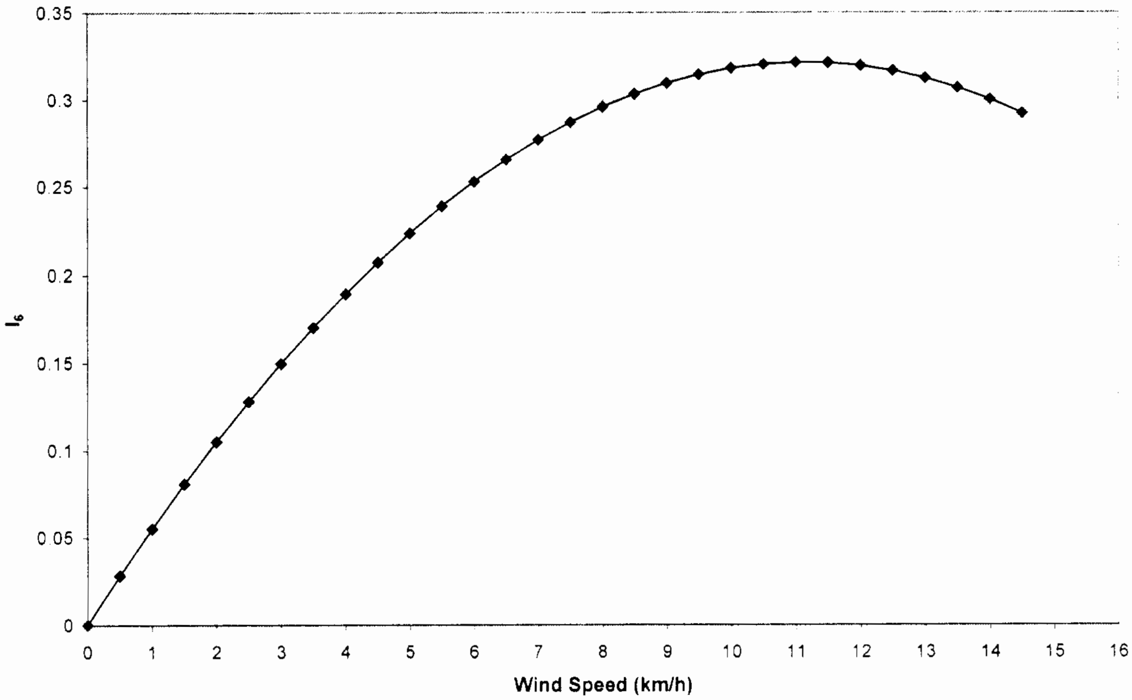


Figure L71. Influence of inspection factor Wind Speed on general DFR.

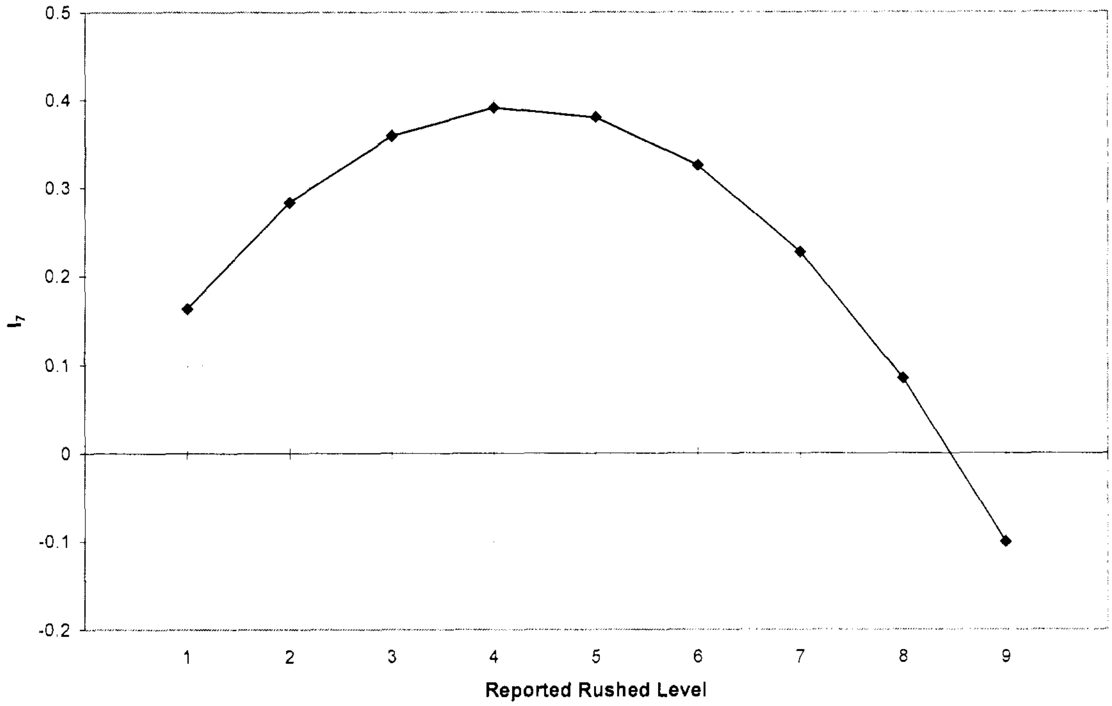


Figure L72. Influence of inspection factor Reported Rushed Level (1=Not rushed, 9=Very rushed) on general DFR.

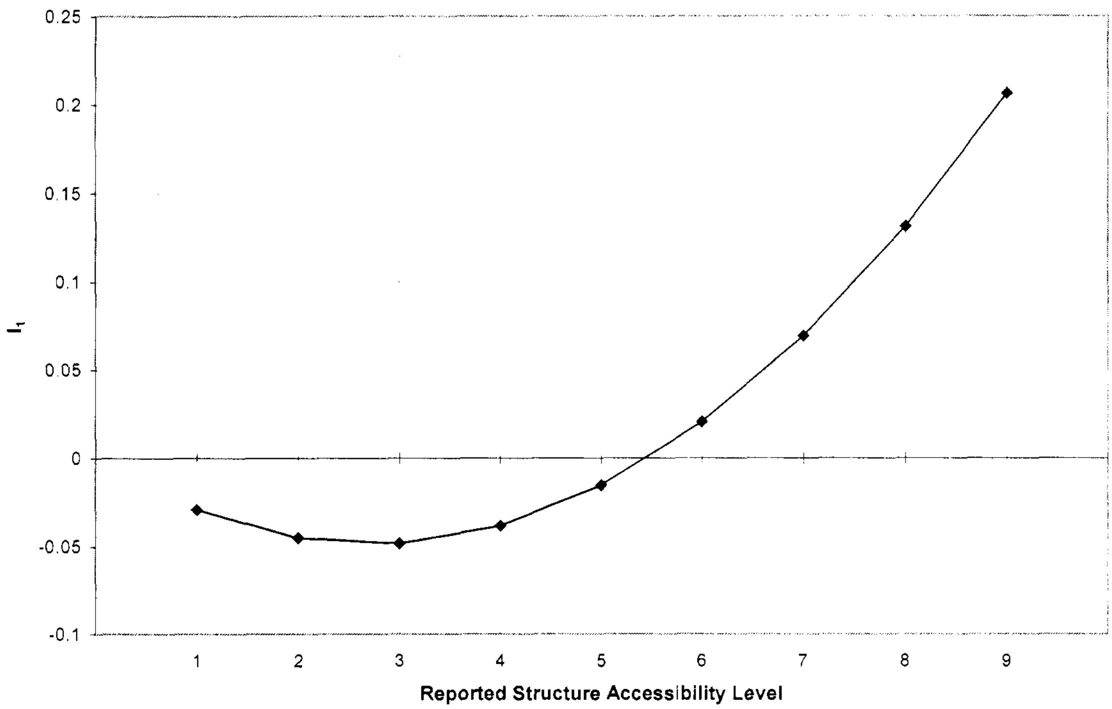


Figure L73. Influence of combined inspector/inspection factor Reported Structure Accessibility Level (1=Very inaccessible, 9=Very accessible) on general DFR.

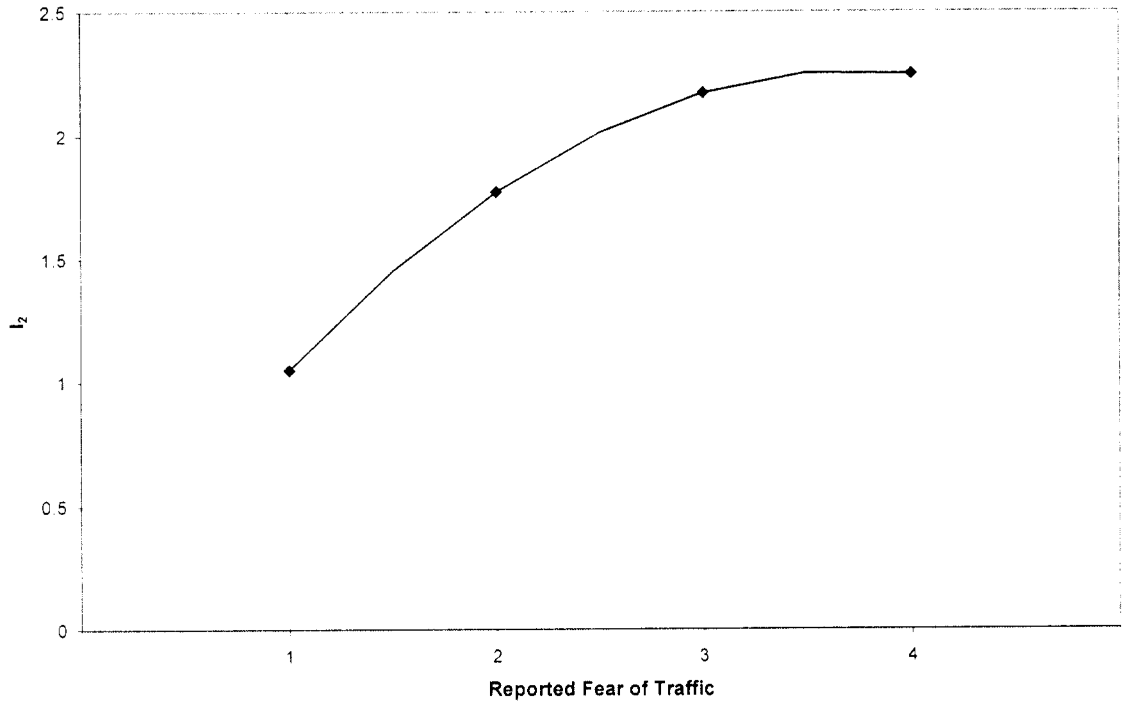


Figure L74. Influence of combined inspector/inspection factor Reported Fear of Traffic (1=Very fearful, 4=No fear) on general DFR.

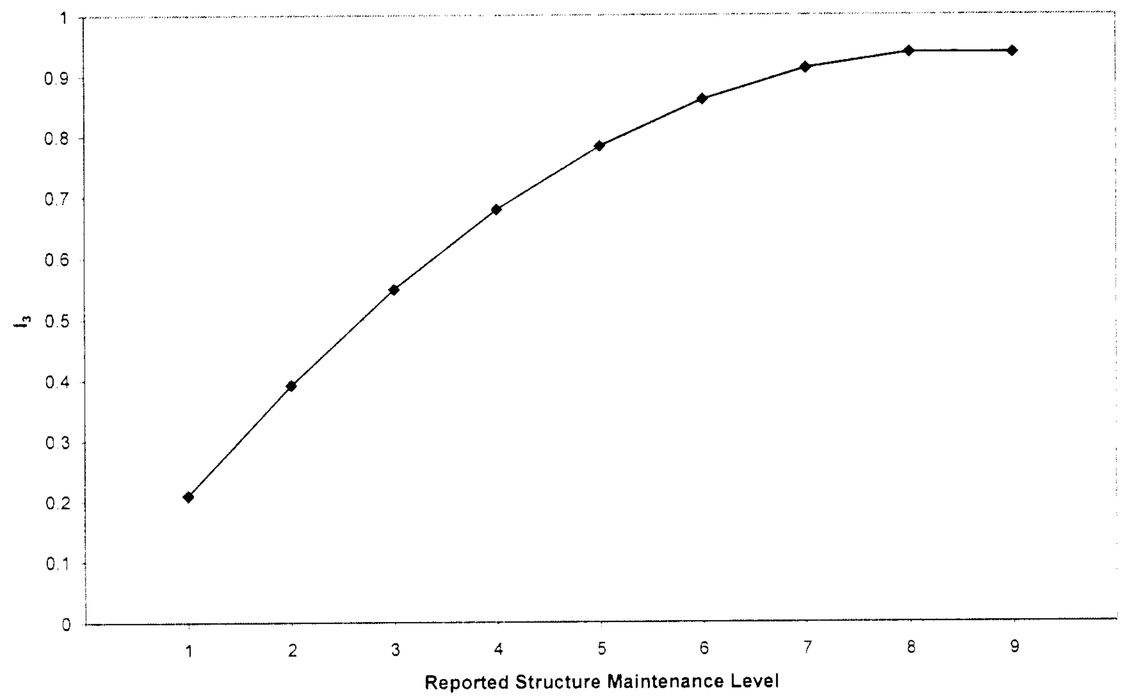


Figure L75. Influence of combined inspector/inspection factor Reported Structure Maintenance Level (1=Very poorly, 9=Very well) on general DFR.

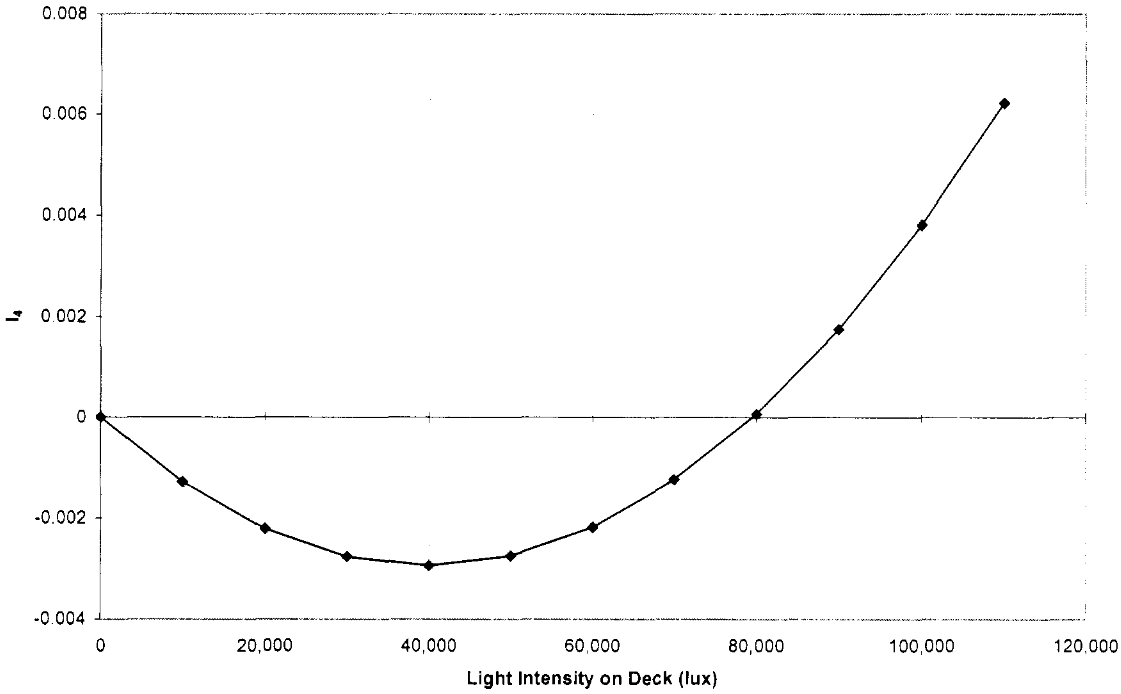


Figure L76. Influence of combined inspector/inspection factor Light Intensity on Deck on general DFR.

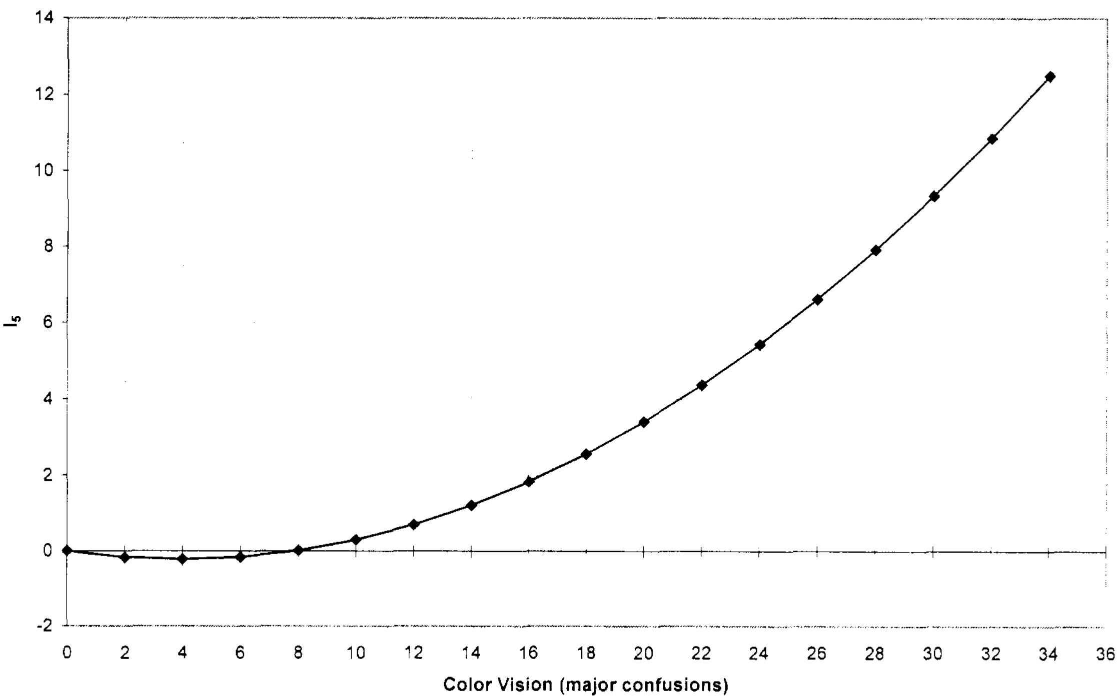


Figure L77. Influence of combined inspector/inspection factor Color Vision (number of major confusions) on general DFR.

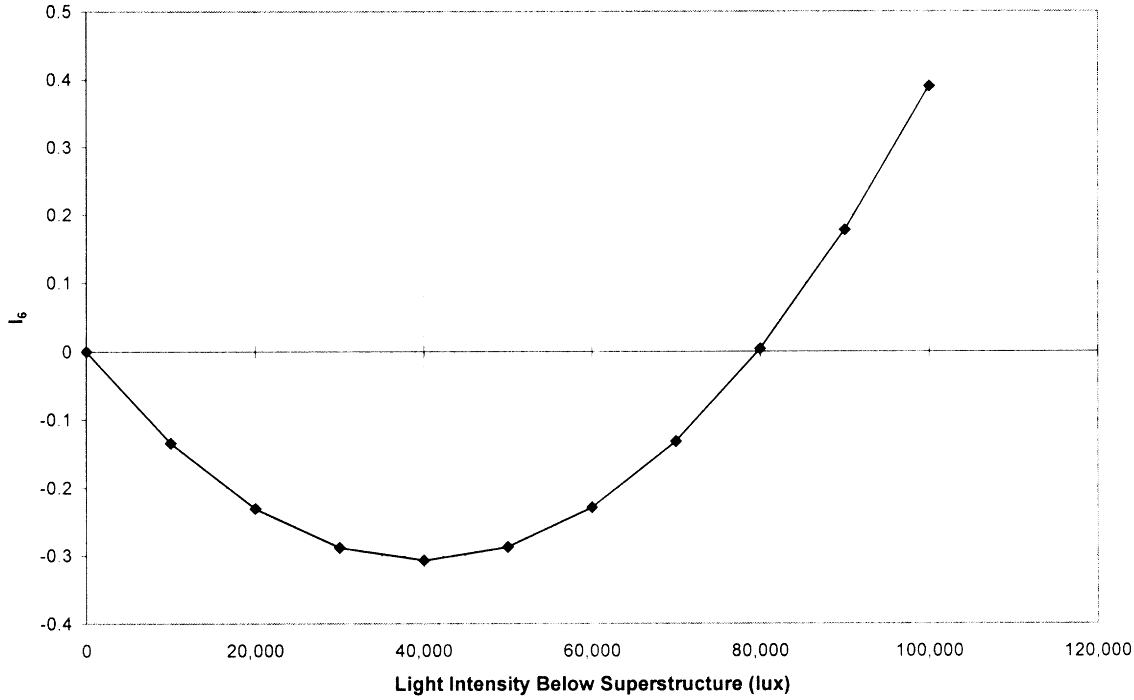


Figure L78. Influence of combined inspector/inspection factor Light Intensity Below Superstructure on general DFR.

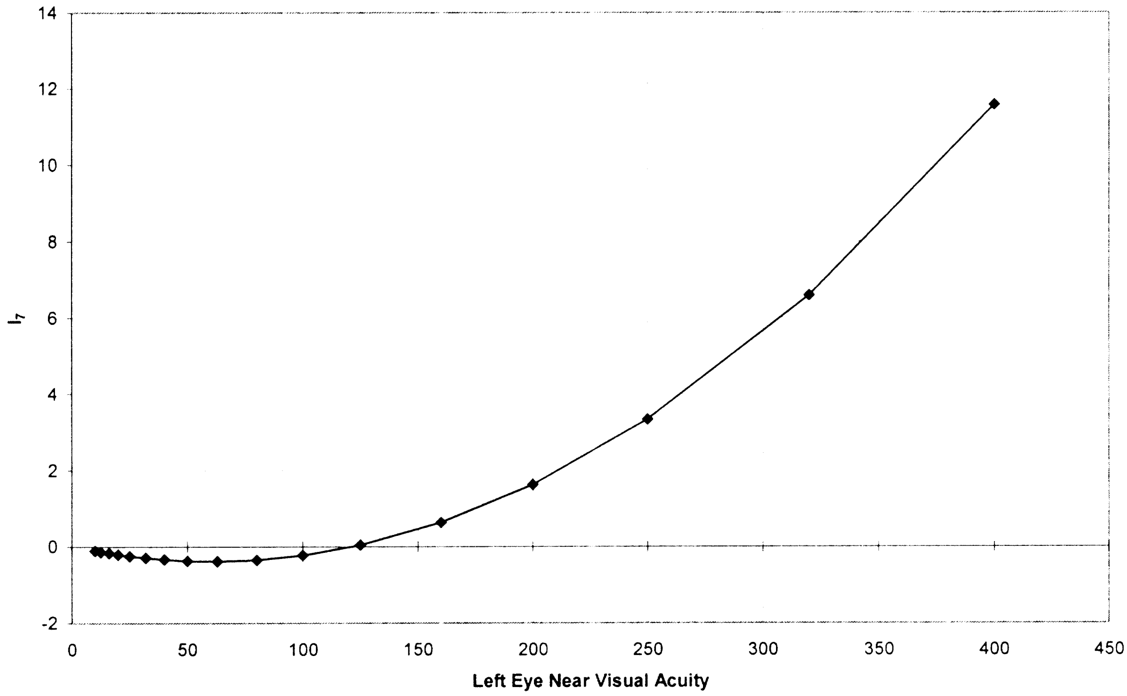


Figure L79. Influence of combined inspector/inspection factor Left Eye Near Visual Acuity on general DFR.

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